August, 1894.]

THE

TRANSACTIONS

OF THE

ROYAL IRISH ACADEMY.

Volume XXX.—Part XIII.

MICROMETRIC OBSERVATIONS OF NEBULÆ MADE AT THE ARMAGH OBSERVATORY.

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DUBLIN:
PUBLISHED AT THE ACADEMY HOUSE, 19, DAWSON-STREET.
SOLD ALSO BY
HODGES, FIGGIS, & CO., Ltd., GRAFTON-STREET.
And by WILLIAMS & NORGATE,
LONDON: 14, Henrietta-street, Covent Garden. | EDINBURGH: 20, South Frederick-street.
1894.

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XIII.

MICROMETRIC OBSERVATIONS OF NEBULÆ MADE AT THE ARMAGH OBSERVATORY. By J. L. E. DREYER, Ph. D.

[Read December 11, 1893.]

Although nearly all the nebulæ visible in our latitude, and bright enough to be well measured with a refractor of average size, have repeatedly been micrometrically observed during the last forty years, this branch of sidereal astronomy can, by no means, be considered as exhausted. No doubt we have hitherto not met with a single instance of a nebula endowed with sensible proper motion, a discovery which must be left to future generations to make, and for which we can only hope to supply some of the materials. But it is of great importance to supply these materials, as determinations of proper motions of nebulæ would render important services towards clearing up the construction of the universe. And the well known considerable systematic errors between different observers, especially in Right Ascension, make it important to repeat the measures with different instruments and observers, rather than trust to observations by one observer on many different nights. In the case of all the bright nebulæ of the northern hemisphere we have probably now a sufficient number of observations for this purpose; but as many somewhat fainter nebulæ have hitherto only been measured by Schönfeld, whose Right Ascensions are rather more affected by systematic errors than those of other observers, I have thought it would be useful to re-measure a number of these objects, and at the same time to observe some brighter nebulæ, by means of which a comparison might be made between my measures and those of Schultz, Vogel, Engelhardt, &c. Some objects not previously measured were also added to the working list.

As this is the first extensive series of observations made with the 10-inch refractor of the Armagh Observatory, it is desirable to give a short description of this instrument before entering on an account of the results obtained with it. The refractor was erected in 1885, in a separate building, a hundred feet south of the Observatory, under a dome 16 feet in diameter, sheeted with papier mâché (which is rivetted to the iron framework, and stitched together with copper wire), and revolving on six "canted" wheels, which move very smoothly and easily on a carefully planed wall-plate. The opening in the roof is in the form of a spherical triangle extending from the zenith to the horizon, where it covers an arc of 60°. The shutter is hinged at the zenith, and is rolled off on two small wheels—a very convenient arrangement, except when objects near the zenith are to be observed. This dome was erected, by subscription, as a Memorial to the late Dr. T. R. Robinson, who for more than fifty-eight years had filled the post of Astronomer of the Observatory. The wall-plate is $8\frac{1}{2}$ feet above the floor, supported by ten iron pillars which are let into the cut-stone work of the foundation wall, and firmly joined together by cross ties.* This iron framework is sheeted with wood, so that it is easier to keep the temperature inside the room equal to that outside, than would be the case in a building of stone or brick. Indeed, the equalisation of temperature is sometimes too perfect, when a sudden considerable rise of temperature covers the whole instrument with dew. A small porch, 4 feet by 9, on the east side of the dome affords room for a sidereal clock, a small table, batteries, and shelves. The floor of the dome and porch is only two feet above the ground.

The refractor is made by Sir Howard Grubb, and is of his usual "standard" form, of ten inches clear aperture, and ten feet focal length. It is mounted on a brick pier, built with cement and sheeted with wood, which rises two feet above the floor, so that the top of the polar axis is 8 feet above the floor. It is needless to say that the object-glass is of excellent quality. The declination circle can be read from the eye-end of the telescope, but for the reading of the Right Ascension circle the observer has to stand on one of two steps at either side of the mounting. This is,

* See the figure on p. 24 of Sir H. Grubb's "Catalogue of Instruments" (1891). There is no transit room attached to the Armagh dome, only a small porch.

however, but a slight inconvenience in the case of an instrument of moderate dimensions. In addition to the usual negative eye-pieces the refractor is supplied with a first surface reflecting solar eye-piece (to which also belongs a wedge of neutral tinted glass for further weakening the intensity of the sun's light), and with two micrometers, both made by Sir H. Grubb. Either of these can be attached to a slipping piece which allows the whole micrometer to be shifted bodily in a plane perpendicular to the optical axis of the telescope by a screw acting against a spring. The position circle is of brass, $7\frac{1}{2}$ inches in diameter, and is attached to the tube of the telescope, the eye-end of which can be rotated either by hand or by a toothed wheel and pinion.

The smaller of the two micrometers has one screw only, which moves a thin slip of steel which can be seen in the dark field without any illumination. Another slip is fixed permanently in the field, parallel to the moveable one, for measuring distances or differences of declination, while a narrower strip, at right angles to the others, serves to measure position angles, or to take transits across. The drum of the screw is divided into 100 parts, and one revolution is equal to 36″. This micrometer was at first used to measure some double nebulæ, as to which it had been asserted, on very slender evidence indeed, that they were endowed with orbital motion,* and it was also used in 1887 to examine a number of doubtful cases which presented themselves during the compilation of the New General Catalogue of Nebulæ. During the progress of the observations described in the following pages, I have, on a few nights, used this micrometer for taking transits of a nebula and a star over one of the bars placed alternately at an angle of 45° and 135° with the parallel. This modification of Boguslawski's micrometer has been suggested by Professor Vogel, and a series of observations of nebulæ made with it has recently been published by Dr. Kempf of the Astrophysical Observatory, Potsdam. It is undoubtedly more convenient than the annular micrometer, and yet possesses the same advantage of allowing very faint objects to be measured, which would not bear even the faintest illumination.

* See my Paper "On some Nebulæ hitherto suspected of Variability or Proper Motion," in the Monthly Notices of the R. Astr. Soc., vol. 47, pp. 412–421.

The larger micrometer is a bifilar one of the usual English construction, presented by Sir Howard Grubb as his contribution to the Robinson Memorial.* The two screws are of equal pitch, and each moves only one spider-line, while there is also only one position wire. This has proved a great advantage in observing faint objects which would have been difficult to see if there had been a greater number of illuminated wires in the field. The number of revolutions made by each screw is read off on a small silver scale on either side of the eye-piece, and this is the only part of the micrometer, or telescope, where the convenience of the observer has not been studied to the utmost degree, as the scales are exceedingly small, and even when a strong magnifier is used, the observer has to be very careful not to make a mistake of one revolution. Fortunately, this is easily detected, as the value of a revolution is large. For the purpose of finding this value in seconds of arc, I have taken transits of Polaris, setting one of the distance wires at a zero-reading of the drum, observing the transit, moving the drum two or three whole revolutions, observing the transit again, and so on for about thirty revolutions, the telescope meanwhile being clamped both in Right Ascension and Declination. The following are the results (computed by the method of least squares) for the screw designated R, the right-hand one when the observer has placed the micrometer before him, so that the figures on the above-mentioned silver scales are upright :—

1891.	Feb. 20,	δ Ursæ min. and 51 Cephei, . .	17″·5895	Weight = 1
,,	May 10,	Polaris, ...	·6220	1
,,	May 11,	,, ...	·5884	2
1892.	Jan. 1,	,, ...	·5933	3
,,	Apr. 29,	,, ...	·5911	3
,,	May 29,	,, ...	·6242	2
,,	Nov. 16,	,, ...	·5970	1
,,	Nov. 26,	,, ...	·5835	3
,,	Dec. 22,	,, ...	·6338	1
,,	Dec. 23,	,, ...	·5965	3
			17″·5980 ± 0″·0033	

* For a general description, see Dr. Gill's article, "Micrometer" in the Encyclopædia Britannica," 9th edition.

The weights have been fixed according to the number of revolutions over which transits were taken, the quality of the image, &c.

This result has been adopted in the reduction of the observations. There is no indication of any dependence on temperature. In order to determine whether the threads of the two screws were equal or not, I observed, on two days in October, 1891, two series of coincidences of the two wires. On the first day (the 19th) the screw R was successively placed at 76·000, and at every second whole revolution down to 26·000, and on the following day the same screw was placed at every second half revolution, from 76·500 to 26·500. The results were—

First Series,	. .	R : L = 1.000465 ± 0·000293
Second do.	. .	1·000373 ± 0·000093
Mean,	. .	R : L = 1·000382 ± 0·000089

The observations of the first series were not as good as those of the second one, as the day was very sunny, and the measures more fatiguing to the eye. The residual errors of both series show, however, very clearly that the above result is much influenced by progressive errors towards both ends of one or both screws, from which the twenty revolutions around the middle of the screw, which have almost exclusively been used in the observations of nebulæ, are free, so that it is perfectly safe to assume the pitch of both screws to be identical for these central parts, and this has accordingly been done. The coincidences of the wires (for determining the zero correction) have always been taken at 50^r, so that even with screw L at 70^r, which place it has hardly ever reached, the error made in assuming $R/L = 1$, instead of using the above result, would only be $0''\cdot13$, a quantity far within the probable error of the observations.

With regard to periodical errors of the screws, I was at first unable to follow the usual method of determining these, as the screws had only one wire each, so that there was no fixed interval which might be measured with various parts of a turn of the screw. It happened, however, that a small piece of spider's web fell on the wire of screw L, in shape something like a small Greek sigma, and so conveniently situated as to be perfectly in focus while allowing the wire R to pass over it without fiddling. The

distance of its end from the wire L was therefore measured with screw R, the screw L being turned one-tenth of a revolution after each measure. Various parts of the screws between 40^r and 60^r were gone through in this way. The following results for the observed distance are each the mean of ten different sets:—

$0^r{\cdot}806$
·808
·802
·799
·800
·807
·808
·801
·800
·802

The periodic errors of screw R are, therefore, exceedingly small, not amounting to more than a few thousandths of a turn. That those of screw L are equally small may be seen from the mean values of the coincidence-correction for every tenth of a turn of L; of course, the irregularities of the two screws are mixed up in the following results:—

$0^r{\cdot}073$
·082
·090
·086
·075
·073
·081
·089
·085
·073

I have, therefore, not applied any correction for periodic or progressive errors of the screws.

The illumination of the micrometer and telescope deserve to be specially mentioned. There are four small electric lamps, each of about one candle-power, one at the back of the micrometer box for bright wire illumination, one about half way up the telescope for bright field (with a small mirror on

an arm which, when not required, can be put out of the way by a long rod running down to the eye-end), one for reading the declination circle, and one in a small hand-lamp for reading the micrometer, &c., which, when not in use, hangs on one of the arms which support the finder. The telescope can be turned about and reversed without being entangled with the connecting wires, as the current passes through two insulated brass rings, one around the upper end of the polar pillar, the other around the declination axis, away from the telescope. The current passes from these rings through two brass combs sliding on them, and moving with the telescope respectively in Right Ascension and Declination.*

The bright wire illumination, which, of course, alone has been employed in the observations of nebulæ, is fairly satisfactory, the wires being free from haziness and the field dark. The brightness of the wires can be modified either by a small rheostat, or by pushing in or pulling out the lamp. A magnifying power of 84 has always been used. The differences of R.A. have been observed by eye and ear, generally over the single position wire, but occasionally, to save time, the micrometer was turned 90°, and transits taken over the distance wires. In the Table of Observations the fourth column gives the number of single wire transits taken. The difference of declination was generally measured separately, except when the objects differed several minutes in R.A., in which case the settings were often made immediately after a wire-transit had been observed. As the fainter nebulæ generally were difficult to see when bisected by a distance wire, I made it a rule in such cases to approach the wire to the nebula alternately from the north and from the south in order, as far as possible, to avoid systematic errors. When $\Delta\delta$ was very small, less than 1′ or so, the nebula and the star were in turn bisected by the same wire, if $\Delta\alpha$ was sufficiently great to allow this to be done; if not, position angles and

* For further details as to the arrangement of wires, &c., see my note in the "Monthly Notices, R. Astr. Soc.," vol. 47, p. 117. The only change made since that note was written was the substitution of a switch with a moveable arm, as the holes of the old switch could not be found in the dark; also the use of a Grove battery instead of a bichromate one, as the latter ran down too soon. The Grove battery is of course very constant, but requires to be rigged up afresh on every observing night.

distances were observed. I have also measured position angles and distances on evenings, when it was found impossible to hear the clock, either from high wind or owing to the amount of muscular energy which in the town was being converted into sound by means of big drums. When position angles and distances are observed, the slipping-piece has been found very useful in testing the accuracy of the setting once or twice before reading off the circle and scales. In the case of observations of difference of declination this can of course be done by the slow motion in declination.

The observed differences of R.A. and Declination have been corrected for differential refraction, and next reduced to the beginning of the year by the well-known formulæ. They were then brought to the common epoch of 1890.0, which is very nearly the mean epoch of the observations. All these reductions were much facilitated by small Tables constructed for the purpose, and accurate enough to give the second decimal of $\Delta\alpha$ and the first of $\Delta\delta$ correctly, even when used for reducing the results of Schönfeld and Schultz from 1865 to 1890, for the purpose of comparing them with mine.

The accuracy of measures of nebulæ must, of course, principally depend on the degree of condensation of the objects, those with a starlike nucleus being sometimes as easily and sharply bisected as a star. I have, therefore, divided the objects observed twice with the same star into three classes—I. containing the much condensed, II. the very gradually condensed, and III. those without condensation, or designated as difficult to observe. The probable errors of one observation were then found to be—

	For $\Delta\alpha$	For $\Delta\delta$	
I.	$\pm 0^s{\cdot}076 \sec\delta$	$\pm 1''{\cdot}18$	17 nebulæ.
II.	$\pm 0{\cdot}166 \sec\delta$	$\pm 2{\cdot}33$	22 ,,
III.	$\pm 0{\cdot}221 \sec\delta$	$\pm 2{\cdot}89$	16, 14 ,,

And from the objects observed more than twice with the same star, nearly all of which are very little condensed or very faint—

$\pm 0^s{\cdot}226 \sec\delta$	$\pm 3''{\cdot}10$	13 nebulæ.

In deducing these values no use was made of the oblique transits, nor of position angles and distances, which are also too few in number to be dealt

with separately. The above values for the probable errors must be considered very satisfactory, particularly when it is remembered that but few of the objects observed at Armagh are bright, or easily observable with a wire micrometer, while the majority are decidedly faint and difficult to measure except with very faintly illuminated wires.*

In order to establish the relation of my measures to those of other observers, I have compared my results with those of Schönfeld and Schultz, with whom I have most objects in common. Their measures are referred to the epoch 1865.o, and they had therefore first to be corrected for precession to my epoch 1890.o. The corrections applied are given in the following Table, which I print here as it may be of use to future observers :—

G. C.	h.	Corr. to $\Delta\alpha$.	Corr. to $\Delta\delta$.	Star.
107	46	$-$ ^{s}·02	$-0''$·2	
342	128	$-$ ·04	-1 ·6	2^{m} 15^{s} p.
351	132	+ ·01	+0 ·7	
352	131	$-$ ·12	+1 ·2	
355	133	$-$ ·07	+0 ·7	
363	137	·00	+0 ·4	
470	183	$-$ ·02	-1 ·6	
549	226	$-$ ·09	+1 ·1	
600	262	·00	+3 ·1	2^{m} 15^{s} f.
604	264	+ ·10	+4 ·2	
627	II. 619	$-$ ·02	+0 ·7	
826	2618	$-$ ·01	-3 ·9	
1202	IV. 33	·00	+3 ·0	
1225	365	·00	-5 ·6	2^{m} 34^{s} p.
1225	365	$-$ ·04	-1 ·1	34^{s} p.
1519	444	+ ·11	+2 ·0	
1532	450	$-$ ·02	0 ·0	
1567	3095	·00	+0 ·4	
1672	513	$-$ ·02	+0 ·2	
1771	564	+ ·01	+1 ·2	
1861	604	$-$ ·11	-2 ·4	
1973	657	+ ·02	+0 ·3	
2028	680	·00	+0 ·1	
2030	678	$-$ ·10	-1 ·1	
2204	755	$-$ ·14	-1 ·2	
2220	768	+ ·04	+0 ·3	

* In the most recent extensive series of measures of nebulæ with a wire micrometer, by M. d'Engelhardt, the objects are divided into five classes, the probable errors ranging from 0^{s}·03 to 0^{s}·22, and from $0''$·3 to $2''$·6. His observations were made with a 12-inch Grubb Refractor ("Observations astronomiques," II. Partie, p. 118).

G. C.	h.	Corr. to $\Delta\alpha$.	Corr. to $\Delta\delta$.	Star.
2347	840	+ ^{s}·05	+ 0″·6	
2501	945	− ·01	− 0 ·2	
2757	1112	+ ·04	0 ·0	
2768	1119	+ ·04	0 ·0	
2776	1126	·00	0 ·0	
2806	1148	− ·02	+ 0 ·1	
2886	1209	− ·07	+ 0 ·2	
2890	1211	− ·07	+ 0 ·2	
3132	1376	− ·05	− 0 ·5	1^{m} 46^{s} f.
3702	1703	+ ·01	− 1 ·2	13^{s} f.
3702	1703	+ ·02	− 1 ·3	1^{m} 16^{s} f.
3704	1705	− ·04	+ 1 ·9	2^{m} 26^{s} p.
3846	1779	− ·03	+ 1 ·5	
3900	1813	·00	− 0 ·1	
3964	1857	·00	− 1 ·0	
4024	3587	− ·03	− 2 ·4	1^{m} 36^{s} f.
4485	2036	+ ·01	+ 0 ·4	
4608	2090	·00	− 1 ·6	
4632	2102	+ ·08	− 0 ·9	34^{s} p.
4632	2102	− ·01	− 2 ·1	1^{m} 19^{s} f.
4670	2120	− ·04	− 1 ·6	
4678	2125	− ·02	+ 0 ·8	
4718	2135	− ·03	− 0 ·2	10^{s} f.
4815	2172	+ ·15	+ 1 ·6	
4879	2199	− ·07	− 1 ·0	
4880	II. 249	− ·01	− 0 ·2	
4883	2201	− ·06	− 0 ·4	
4886	2202	·00	+ 0 ·1	
4887	2203	·00	+ 0 ·2	
4892	2205	− ·04	− 0 ·9	
4909	2216	− ·03	− 0 ·7	
4928	2226	+ ·05	− 1 ·5	
4932	2227	− ·05	+ 1 ·0	
4939	2232	− ·02	− 0 ·2	
5029	2282	+ ·01	0 ·0	

Only such objects were compared which had been measured from the same comparison star. The "Dumb-bell nebula" and h. 2205 were omitted, as different points appeared to have been observed, and here again my few observations of oblique transits were left out. The results are—

	$\Delta\alpha \cos\delta$	$\Delta\delta$	
Schönfeld I.—Dreyer,	− 0^{s}·106	− 0″·05	27 nebulæ.
Schönfeld II.—Dreyer,	+ 0 ·042	+ 0 ·74	38 ,,
Schultz—Dreyer,	+ 0 ·071	+ 0 ·08	26 ,,

The first two comparisons give in Right Ascension,

Schönfeld I.–II. = – $0^s{\cdot}15$

while Schönfeld found by direct comparison between his two series – $0^s{\cdot}21$, and through comparisons with Schultz – $0^s{\cdot}19$. The reality of the systematic errors in Right Ascension observations of nebulæ has thus again been confirmed by the present series of observations, while the differences in declination must be considered as mere accumulations of accidental errors. It appears that I differ less from Schönfeld in R.A. than any previous observer has done, but his Right Ascensions of nebulæ remain the smallest of any as yet determined. I think, however, that it would at the present moment be premature to attempt to combine the results of all known micrometric measures in order to form a catalogue of exact places of nebulæ, but it seems likely that photography might here lead to interesting results, and supply the standard Right Ascensions which appear so difficult to get hold of.

The Table of Observations requires little or no explanation. The apparent $\Delta\alpha$ and $\Delta\delta$ have already been corrected for refraction ($\Delta\alpha$ required this correction very rarely, as the observations were generally taken near the meridian). The magnitudes of the comparison stars were taken from the Durchmusterung. Opposite the results of my measures will be found short descriptions of the objects (using the well known abbreviations), remarks about the state of the sky, &c., all exactly as written down at the telescope, also measures of neighbouring faint stars, and a few approximate measures of faint companion nebulæ. Some further remarks about a few objects of special interest will be found under the heading "Notes" at the end of the Table of Observations.

[TABLE OF OBSERVATIONS.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
VI. 35 (68)	89 9 24	+ 0 31·50	5	+ 4 23·9	4	+ 0 31·51	+ 4 23.9	1	8·9
	90 10 14	0 31·20	4	4 25·0	2	0 31·20	4 25·0		
						+ 0 31·36	+ 4 24·5		
II. 3 (78)	88 11 6	+ 0 7·10	7	− 6 3·0	5	+ 0 7·10	− 6 3·0	2	8·3
	88 12 5	0 7·33	6	6 14·0	3	0 7·33	6 13·9		
						+ 0 7·21	− 6 8·5		
35 (90)	89 9 24	+ 1 0·07	6	+ 2 38·9	3	+ 1 0·08	+ 2 38·9	3	8·8
	90 10 18	1 1·00	4	2 44·7	3	1 0·99	2 44·7		
	92 9 16	1 1·69	8	2 49·3	4	1 1·68	2 49·4		
	92 9 27	1 0·73	6	2 47·9	4	1 1·72	2 47·9		
						+ 1 1·27	+ 2 40·4		
46 (107)	88 11 6	+ 0 30·49	6	+ 0 48·4	4	+ 0 30·48	+ 0 48·4	4	8·0
	89 10 30	0 31·27	4	0 39·7	3	0 31·27	0 39·7		
	91 12 20	0 30·95	4	0 36·9	2	0 30·95	0 36·9		
						+ 0 30·90	+ 0 41·7		
71 (158)	89 10 23	+ 0 0·81	—	− 2 55·8	—	+ 0 0·81	+ 2 55·8	5	8·5
	90 10 14	0 0·51	5	2 43·8	2	0 0·51	2 43·8		
						+ 0 0·66	− 2 49·8		
128 (342)	88 12 5	+ 2 14·23	3	− 1 9·5	2	+ 2 14·22	− 1 9·6	6	8·1
	92 11 16	2 15·02	6	− 1 5·7	2	2 15·02	1 5·6		
						+ 2 14·62	− 1 7·6		
	88 12 7	+ 0 9·57	6	+ 9 53·6	6	+ 0 9·57	+ 9 53·6	7	7·8
	92 11 16	0 10·37	10	9 50·0	2	0 10·37	9 50·0		
						+ 0 9·97	+ 9 51·8		
130 (343)	88 12 7	+ 0 25·37	6	+ 8 6·4	2	+ 0 25·37	+ 8 6·4	7	7·8
132 (351)	88 12 7	− 0 50·04	5	− 0 36·8	5	− 0 50·04	− 0 36·8	8	6·1
	92 11 16	0 49·67	3	0 37·3	2	0 49·67	0 37·2		
						− 0 49·85	− 0 37·0		

	DESCRIPTION AND REMARKS.
h. G. C.	—
— (68)	pF, pS, irreg.; query: E spnf cometic; many stars near, perhaps stars involved; declination difficult, not much condens. pF, pL, R, vlbM; obs. most difficult; clock nearly inaudible; wind high.
— (78)	Very bad object to observe; vvlbM, cometary, has a * 9·2 sp. Poor object; no condensation; * 9p 3^s·33 (6), 5′13″·9 south (2).
35 (90)	B, vL, very diffused, vvlbM. Give obs. half weight. pB, vL, vlbM, vl condensation, difficult to observe well. Obs. fairly good, though neb. has very little condensation, and the little there is seems to be sp the centre. pB, E spnf, dif. vlbM.
46 (107)	pB, S, R, mbM, *12·5 sp. 1′. pF, pS, * 12m 1½′ sp, * 11·5 farther sp, the three objects nearly in line. vS, mbM, almost stellar.
71 (158)	pL, mbM, extremely difficult owing to fog. $\Delta\alpha$ and $\Delta\delta$ computed from Pos. Angle 177°·3 (3). Dist. 176″·0 (2). pB, pL, R, vglbM, $\Delta\alpha$ indirect, from * 12 nf the comp. *; it follows the neb. 10^s·37 (6) and follows the comp. * 10^s·88 (5)
128 (342)	Sky poor, but probably a fine object with good condensation. Clouds came on.
	B, pL, vgbM.
130 (343)	vF, dif, well seen in dark field, but vvF near the bright wires.
132 (351)	pB, pS, gmbM. Very damp night; this neb and the p one not well seen.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. M
		m s		′ ″		m s	′ ″		
— (348)	90 10 18	− 1 6·47	3	− 0 45·8	2	− 1 6·47	− 0 45·8	(352)	n
— (349)	90 10 18	− 0 38·65	2	− 0 53·0	1	− 0 38·65	− 0 53·0	(352)	n
131 (352)	90 10 18	− 1 25·93	3	− 1 4·8	2	− 1 25·93	− 1 4·8	9	9
133 (355)	89 10 28	− 0 53·25	4	+ 0 29·8	3	− 0 53·26	+ 0 29·9	10	8
	90 10 18	0 53·08	5	0 26·5	2	0 53·08	0 26·4		
						− 0 53·17	+ 0 28·2		
— (358)	88 11 6	− 0 29·70	5	− 2 8·9	3	− 0 29·70	− 2 9·0	11	8
137 (363)	88 11 6	+ 0 19·82	6	+ 2 7·8	4	+ 0 19·82	+ 2 7·8	11	8
183 (470)	88 11 30	+ 1 33·83	3	+ 4 31·4	4	+ 1 33·83	+ 4 31·2	12	8
	90 11 15	1 34·46	5	4 27·5	3	1 34·36	4 27·5		
						+ 1 34·10	+ 4 29·3		
	88 11 30	+ 1 28·90	5	+ 0 25·2	3	+ 1 28·90	+ 0 25·1	13	9
	90 11 15	1 29·06	5	0 25·6	3	1 29·06	0 25·6		
						+ 1 28·98	+ 0 25·4		
226 (549)	89 11 23	− 0 47·89	8	− 1 45·6	3	− 0 47·88	− 1 45·6	14	8
	91 10 28	0 47·55	4	1 47·3	2	0 47·55	1 47·4		
						− 0 47·72	− 1 46·5		
229 (551)	88 12 7	− 1 35·90	5	+ 4 54·9	4	− 1 35·90	+ 4 55·0	15	8
		− 1 36·35	4	— —		− 1 36·35	— —	16	5
232 (560)	89 11 23	− 1 29·25	4	+ 5 8·4	2	− 1 29·24	+ 5 8·3	17	7
	92 9 27	1 29·23	4	5 11·6	4	1 29·22	5 11·4		
						− 1 29·23	+ 5 9·9		
258 (591)	88 11 27	+ 0 14·84	5	− 6 19·0	2	+ 0 14·84	− 6 19·0	18	7
	92 1 1	0 14·15	4	6 18·8	3	0 14·15	6 18·7		
						+ 0 14·50	− 6 18·8		

h. G. C.	DESCRIPTION AND REMARKS.
— (348)	vvF, sky not good.
— (349)	Similar to the p one.
131 (352)	M 33. The brightest part is cometary, * 13 attached to the nnf end; the condensation is very gradual and slight. $19^s{\cdot}50$ p and $100''{\cdot}0$ north is an involved "knot." [= N. G. C. 595 = 1 in Lord Rosse's diagram.]
133 (355)	B, vS, R, mbM, * 10sf, Pos. A. 135° ±. 20^s p the comparison star, nearly on parallel, is a * 9·3; seems red; thin clouds. pB, pS, vmbM, * 12 Pos. 135° ±. Dist. about ¾′.
— (358)	* 11 mag; seems slightly nebulous, but I was not quite sure about it. [See Notes.]
137 (363)	
183 (470)	pB, L, m E nnpssf. pB, m E about 170°, pL Nucleus E in same direction.
226 (549)	pB, m E npsf, bM, has, perhaps, several points of condensation.
229 (551)	Perhaps barely of the II. Class, pm E 215° to 220°, mbM. [See Notes.]
232 (560)	pB, cL, mE Pos. 70°±; two stars 12 sp.; Pos. between the two stars 45°. pB, E np sf, mbM; two stars sp. Not well seen through thin clouds.
258 (591)	Very difficult, sky very poor. A * 8·0 f 28^s after the comp. star, a few seconds north of it, having a * 10 2′ np. vF, pS, vlbM; most difficult; * 11 2′ (or less) np.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
262 (600)	88 11 27	− 2 15·62	4	− 0 50·1	4	− 2 15·61	− 0 49·9	20	8
	88 11 30	− 0 36·22	5	− 6 7·1	3	− 0 36·22	− 6 7·0	19	8
264 (604)	88 12 8	− 3 0·90	5	—	—	− 3 0·89	—	21	9
	89 11 19	3 0·46	7	+ 5 52·7	4	3 0·46	+ 5 52·9		
						− 3 0·67	+ 5 52·9		
II. 619 (627)	91 12 20	− 0 29·33	6	− 0 33·1	2	− 0 29·33	− 0 33·4	22	8
2523 (692)	88 12 8	+ 0 7·43	12	+ 3 32·8	5	+ 0 7·43	+ 3 32·8	23	7
2618 (826)	89 1 21	+ 1 58·03	3	+ 2 7·4	3	+ 1 58·02	+ 2 7·2	24	8
	91 1 9	1 58·32	5	+ 2 7·9	5	1 58·31	2 8·0		
						+ 1 58·17	+ 2 7·6		
319 (866)	88 12 7	− 0 41·98	4	− 3 2·1	5	− 0 41·98	− 3 2·0	25	8
	88 12 8	0 42·09	8	2 58·9	4	0 42·09	2 58·8		
						− 0 42·04	− 3 0·4		
IV. 33 (1202)	91 1 31	− 1 25·35	6	+ 0 6·5	4	− 1 25·34	+ 0 6·4	26	8·8
	91 2 4	1 25·23	4	0 6·8	4	1 25·22	0 6·7		
						− 1 25·28	+ 0 6·6		
365 (1225)	91 1 31	+ 2 33·71	7	− 0 23·8	5	+ 2 33·70	− 0 23·6	27	9·0
	91 2 4	2 33·67	3	0 23·4	3	2 33·66	0 23·2		
						+ 2 33·68	− 0 23·4		
	91 2 4	+ 0 33·98	4	− 4 33·5	4	+ 0 33·98	− 4 33·3	28	9·1
444 (1519)	91 1 31	− 2 38·83	3	+ 3 16·1	3	− 2 38·82	+ 3 15·9	29	7·6
	91 2 4	2 39·30	4	3 21·8	4	2 39·29	3 21·6		
						− 2 39·05	+ 3 18·8		
445 (1520)	87 2 25	+ 0 2·04	—	+ 0 17·1	—	+ 0 2·04	+ 0 17·1	444	neb.
	87 2 28	0 2·15	—	0 16·4	—	0 2·15	0 16·4		
						+ 0 2·10	+ 0 16·7		

h. G. C.	DESCRIPTION AND REMARKS. —
262 (600)	Very hazy outline.
264 (604)	B, pL, iF; very little, if any, condensation; sky clear; ☾ set. B, pL, E sp nf; no condensation.
II. 619 (627)	
2523 (692)	pB, pL, vlbM; diffused.
2618 (826)	Δα and Δδ by oblique transits over bars of small micrometer. Two stars 12m sf, one f 16ˢ·36, 155″·7 south, the other, f 21ˢ·70, 99″·5 south of neb. B, L, irrR, L Nucleus. The second one of the two stars f 21ˢ·57, 104″·1 south.
319 (866)	pF, pS, iF or E. Follows a group of four small stars. Companion nebula north, G. C. 867; not seen with certainty, sky having become worse. Companion nebula not seen.
IV. 33 (1202)	A * 10·11 in cometary nebulosity; distinctly excentric, star being towards the sf edge. A * 11·5 excentric in pB neb. of irregular form. There is *not* a nucleus np the star, as stated by D'Arrest. Neb. looks like a comet. I see more neb. sp. the * than I did the other night.
365 (1225)	Planetary, diffused edges, R, pS. Ill-defined, yet of same character as other planetary nebulæ.
444 (1519)	Brighter and more condensed than the nf one.
445 (1520)	Δα and Δδ computed from Pos. Angle 57°·3 (6), Dist. 31″·6 (3). " " " " " 59°·6 (4), " 32·4 (4). [See Notes.]

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
450 (1532)	92 3 18	− 0 0·37	—	− 1 41·7	3	− 0 0·37	− 1 41·6	30	8·0
	93 3 9	0 0·36	—	1 40·5	3	0 0·36	1 40·5		
						− 0 0·36	− 1 41·0		
464 (1565)	91 2 4	+ 0 27·15	4	+ 5 12·3	3	+ 0 27·15	+ 5 12·4	31	8·5
	93 3 7	0 27·00	5	5 7·2	4	0 26·99	5 7·3		
						+ 0 27·07	+ 5 9·8		
3095 (1567)	93 3 7	− 0 12·47	3	− 0 1·0	2	− 0 12·47	− 0 1·0	32	8·7
	93 3 9	0 12·30	5	0 2·2	3	0 12·30	0 2·3		
						− 0 12·38	− 0 1·6		
513 (1672)	93 3 9	− 0 9·64	5	− 2 14·1	3	− 0 9·64	− 2 14·1	33	6·3
	93 3 20	0 9·97	6	2 12·9	2	0 9·97	2 12·9		
						− 0 9·80	− 2 13·5		
536 (1721)	93 3 7	− 0 55·62	6	+ 4 43·9	4	− 0 55·62	+ 4 43·7	34	6·9
	93 3 9	0 55·36	5	4 40·6	3	0 55·36	4 40·4		
						− 0 55·49	+ 4 42·0		
— (1725)	93 3 9	− 0 23·04	5	+ 9 20·1	4	− 0 23·05	+ 9 20·0	34	6·9
	93 3 20	0 23·44	8	9 30·1	6	0 23·45	9 30·0		
						− 0 23·25	+ 9 25·0		
538 (1726)	93 3 7	+ 0 13·37	6	− 2 19·5	4	+ 0 13·37	− 2 19·4	34	6·9
	93 3 9	0 13·41	7	2 14·4	4	0 13·41	2 14·4		
	93 3 20	0 13·39	7	2 17·4	4	0 13·39	2 17·3		
						+ 0 13·39	− 2 17·0		
— (1727)	93 3 20	+ 0 25·63	4	+ 1 7·2	4	+ 0 25·63	+ 1 7·3	34	6·9
II. 281 (1730)	93 3 9	+ 0 31·14	5	− 10 18·2	3	+ 0 31·15	− 10 18·0	h 538	neb.
564 (1771)	92 3 18	− 0 48·26	5	+ 0 22·2	6	− 0 48·26	+ 0 22·1	35	9·5
	93 3 20	0 48·22	4	0 22·9	3	0 48·22	0 22·7		
						− 0 48·24	+ 0 22·4		

	DESCRIPTION AND REMARKS.
h. G. C.	—
450 (1532)	pB, stellar, vmbM. $\Delta\alpha$ computed from $\Delta\delta$ and Pos. Angle 2°·95 (2). Stellar. $\Delta\alpha$ computed from $\Delta\delta$ and Pos. 2°·9.
464 (1565)	pB, pL, vlbM. * on sf edge. Not a good object to observe; no condensation. Is certainly not a planetary neb.; cometary. It is situated in a hollow, or bay, in the north end of the magnificent cluster M. 46. Reminds me of h. 399. * 12 at sf edge. Does not look like a plan. neb. Beautiful field.
3095 (1567)	Planetary; like a dull star of the 8th mag. Very stellar looking.
513 (1672)	vF, mbM, * 12 close nf, another f, the 2 form an isosceles △ with the * 6. A very difficult object on account of the B star and low altitude. pF, not much condensation. F * nf close (but separated from the neb.); it precedes the comparison star 7ˢ·20 (3), and is 79″·9 south of it. This F * forms, with the B * and two others, n and f, a parallelogram.
536 (1721)	pB, pS, R, * 12 npp 1′. Through and between thin clouds. "R. novæ" not seen with certainty. pF, S, gmbM, between two stars; the f one is eF.
— (1725)	vF, pL, R; no condensation; most difficult to measure; nf h 536.
538 (1726)	F, pS, mbM. Clouds came on. Fine night.
— (1727)	vF, S, * 13 np ½′ ±.
II. 281 (1730)	vF, mE ssp nnf, between two F stars, a little north of neb. Fine night.
564 (1771)	B, pL, R, glbM, * 11·12 f 15ˢ·5 on parallel. B, pL, mbM; looks like a globular cluster seen with a small aperture.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag
		m s		′ ″		m s	′ ″		
592 (1835)	92 3 18	+ 1 40·15	4	+ 4 8·9	4	+ 1 40·14	+ 4 9·2	36	5·5
	92 3 28	1 40·27	4	4 10·3	4	1 40·26	4 10·5		
						+ 1 40·20	+ 4 9·7		
604 (1861)	92 3 18	+ 1 49·63	6	− 4 50·7	6	+ 1 49·63	− 4 50·4	37	8·9
	93 3 7	1 49·68	5	4 41·6	3	1 49·69	4 41·2		
						+ 1 49·66	− 4 45·8		
626 (1898)	93 3 7	+ 0 44·05	4	− 3 42·7	4	+ 0 44·05	− 3 42·5	38	8·7
657 (1973)	91 3 30	− 0 18·50	4	− 0 58·0	2	− 0 18·50	− 0 58·0	39	9·2
	92 3 18	0 18·63	6	1 3·2	2	0 18·63	1 3·2		
						− 0 18·56	− 1 0·6		
680 (2028)	89 3 30	− 0 7·94	7	+ 0 50·4	6	− 0 7·94	+ 0 50·4	41	8·7
	91 4 11	0 7·78	6	1 0·2	3	0 7·78	1 0·2		
	92 3 18	0 7·90	4	0 53·3	3	0 7·90	0 53·3		
						− 0 7·87	+ 0 54·6		
678 (2030)	92 3 28	+ 1 0·32	5	− 0 5·9	3	+ 1 0·33	− 0 5·7	40	8·8
	92 3 30	1 0·20	5	0 1·3	4	1 0·21	0 1·2		
						+ 1 0·27	− 0 3·5		
755 (2204)	92 3 28	+ 1 42·37	4	− 1 38·1	3	+ 1 42·38	− 1 37·9	42	9·5
	93 3 20	1 42·02	5	1 43·4	2	1 42·04	1 43·1		
						+ 1 42·21	− 1 40·5		
768 (2220)	92 3 28	− 0 28·16	5	− 1 30·3	2	− 0 28·16	− 1 30·4	43	9·1
	93 3 20	0 28·00	7	1 22·9	2	0 28·01	1 23·0		
						− 0 28·08	− 1 26·7		
786 (2243)	91 3 30	− 1 56·48	4	− 1 12·6	3	− 1 56·47	− 1 12·8	44	8·7
	91 4 8	1 57·00	4	1 16·5	4	1 56 99	1 16·7		
						− 1 56·73	− 1 14·7		
840 (2347)	89 3 30	− 1 21·25	6	− 1 47·6	5	− 1 21·25	− 1 47·6	45	6·7
	90 4 8	1 21·38	6	1 48·6	3	1 21·37	1 48·6		
						− 1 21·31	− 1 48·1		

h. G. C.	DESCRIPTION AND REMARKS.
592 (1835)	pB, pL, R, gbM; difficult, as there are thin clouds at this low altitude. pB, pL, E np sf, gmbM, * 9 nf 4′.
604 (1861)	G. C. 1863 is nf, much fainter and less condensed; connection well seen; in fact it is only a diffused appendage to h 604. Nucleus is oval.
626 (1898)	Very diffused object, pF, pL; no condensation.
657 (1973)	pB, pL, lenticular; Pos. of E 100°±, B * p on parallel. pB, pL, irr R, glbM.
680 (2028)	F, vS, R, * 12 np. The comp. star forms Δ with two slightly brighter stars following. pF, pL, R, gbM, between * 11 np and * 9·0 sf. Twilight and ☾ above the horizon. F, vS, vlbM, * 8·7 f $22^{s}\cdot03$, north, and * 8·4 f $32^{s}\cdot87$, south. Wind high; sky middling, definition good.
678 (2030)	pF, S, vmbM; G. C. 2031 is np, $\Delta\alpha = -14^{s}\cdot9$ (2), eeF, especially near the bright wires; G. C. 2032 follows $4^{s}\cdot9$ (5), about 267″ (1) north of h 678; eF, vS, difficult, between two stars 12, sp and nf, nearer the former. pF, vS, bM, 2031 p. $15^{s}\cdot4$ (2), 2032 f $4^{s}\cdot9$ (2). No Δδ taken, as there are thin clouds, and I could only see the two "R. novæ" with very faint illumination. [See Notes.]
755 (2204)	pB, pS, smbM, lEpf. pF, S, R, vlbM.
768 (2220)	pF, pS, lE, bM. pF, S, R, vlbM.
786 (2243)	pB, pL, lE npp sff, vlbM. vlbM, pmEnpsf; rather F near the bright wires.
840 (2347)	pB, pL, E in parallel; soft nucleus. B, pL, about 2′ long, Epf; fairly distinct nucleus; fades gradually away.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.0.	Δδ 1890.0.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
849 (2361)	92 3 18	− 0 52·73	6	+ 2 32·2	4	− 0 52·73	+ 2 32·1	46	9·0
	92 3 28	0 52·53	7	2 31·6	3	0 52·53	2 31·5		
						− 0 52·63	+ 2 31·8		
882 (2405)	89 4 28	− 0 34·34	5	− 5 19·9	9	− 0 34·34	− 5 19·9	47	6·1
	91 3 30	0 34·08	5	5 13·1	3	0 34·08	5 13·2		
	91 4 8	0 33·84	5	5 23·9	5	0 33·84	5 24·0		
						− 0 34·09	− 5 19·0		
945 (2501)	91 4 8	+ 1 3·68	5	+ 4 13·0	3	+ 1 3·68	+ 4 13·1	48	8·2:
973 (2541)	89 5 1	− 0 42·50	6	+ 4 41·3	5	− 0 42·50	+ 4 41·3	49	8·5
	90 4 8	0 41·98	4	4 31·7	3	0 41·98	4 31·7		
	92 3 30	0 42·34	5	4 38·7	4	0 42·34	4 38·6		
						− 0 42·27	+ 4 37·2		
1022 (2626)	91 3 30	+ 0 14·40	3	− 6 48·7	3	+ 0 14·40	− 6 48·7	50	9·0
	91 4 11	0 13·97	6	6 49·8	5	0 13·97	6 49·8		
	92 4 29	0 13·93	9	6 53·9	5	0 13·93	6 53·8		
						+ 0 14·10	− 6 50·8		
1041 (2652)	91 4 11	− 2 7·81	4	+ 1 42·0	4	− 2 7·81	+ 1 41·8	51	9·5
1112 (2757)	91 3 30	− 0 50·07	3	+ 0 39·7	2	− 0 50·07	+ 0 39·7	52	9·3
	91 4 8	0 50·24	5	0 38·7	3	0 50·24	0 38·6		
						− 0 50·16	+ 0 39·1		
1119 (2768)	89 5 1	− 0 48·80	6	+ 8 35·4	4	− 0 48·80	+ 8 35·3	54	9·0
	90 4 14	0 48·87	6	8 36·3	3	0 48·87	8 36·2		
						− 0 48·84	+ 8 35·8		
1126 (2776)	90 4 14	− 0 5·29	10	− 1 25·9	3	− 0 5·29	− 1 25·9	53	9·5
	91 4 8	0 4·93	6	1 24·1	4	0 4·93	1 24·1		
	93 3 9	0 5·15	6	1 24·9	2	0 5·15	1 24.9		
						− 0 5·12	− 1 25·0		

h. G. C.	DESCRIPTION AND REMARKS.
849 (2361)	pF, pL, R, gbM, * 9·5 3′ nnp. pB, S, R, smbM, * nnp.
882 (2405)	Easily seen in dark field, but even with faint illumination it was not very good to observe. I should call it F, or barely II. Class. Elongated nppsff, or nearly pf. pB, though perhaps barely II. Class; diffused, vlbM, E pf, * 13 about 2′ nnf. The bright star rather disturbes when estimating the brightness of the nebula. pB, Epf, diffused. I think there has not been any change of brightness during the last two years. Good object to measure. [See Notes.]
945 (2501)	pF, pL, E 83°·0 (one measure); very diffuse; vlbM; south edge perhaps sharper. [See Notes.]
973 (2541)	pB, pS, mbM. pB, S, R, psbM. Observed through and between clouds. B, S, R, mbM. A * 9·3 [D. M. + 14°, 2436] nf, $\Delta\alpha = -53^s{\cdot}70$ (5); $\Delta\delta = -78''{\cdot}3$ (2), for 1890 $-78''{\cdot}4$.
1022 (2626)	pB, pL, lE. Badly seen through thin clouds. pF, pL, E sp nf, mbM. ☾ setting.
1041 (2652)	pB, cL, stellar Nucleus; vmE about 60° or 70°. Tried to measure the Pos. Angle of elongation, but the outer part of the nebula would not bear illumination. [See Notes.]
1112 (2757)	pB, L, R, lbM. Sky not very transparent; definition good. Sky very bright, as if by faint moonlight; definition fair.
1119 (2768)	— pB, pL, E np sf, F stellar nucleus.
1126 (2776)	vF (sky very bad), mE np sf. mE 160°±, nucleus almost stellar, though oblong in the same Position Angle. pB ray, pS, mbM; fine object; fine night.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
1134 (2787)	89 5 1	+ 0 46·66	5	+ 6 34·7	3	+ 0 46·65	+ 6 34·7	54	9·6
	93 3 20	0 47·17	6	6 32·8	2	0 47·17	6 32·9		
						+ 0 46·91	+ 6 33·8		
II. 165 (2795)	93 3 22	+ 0 3·58	6	− 6 57·8	3	+ 0 3·58	− 6 57·8	55	9·5
1148 (2806)	93 3 20	+ 0 41·00	7	+ 0 26·7	3	+ 0 41·00	+ 0 26·8	55	9·5
	93 3 20	0 41·24	5	0 20·1	3	0 41·24	20·1		
						+ 0 41·12	+ 0 23·4		
1209 (2886)	93 3 22	+ 1 42·01	7	− 0 11·7	2	+ 1 42·02	− 0 11·7	56	6·5
1211 (2890)	93 3 22	+ 1 35·90	5	− 0 20·1	2	+ 1 35·91	− 0 20·0	57	9·1
1281 (3002)	92 3 28	− 0 34·88	5	− 7 4·9	2	− 0 34·89	− 7 4·9	—	9·2
	92 3 30	0 35·00	4	7 17·5	2	0 35·01	7 17·5		
	93 3 9	0 35·30	5	7 9·8	2	0 35·31	7 9·7		
						− 0 35·07	− 7 10·7		
	92 3 30	− 2 43·48	5	− 5 51·3	4	− 2 43·51	− 5 51·5	58	9·0
	93 3 9	2 43·82	5	5 45·2	3	2 43·87	5 45·4		
						− 2 43·69	− 5 48·4		
1376 (3132)	92 3 28	− 1 6·64	7	—	—	− 1 6·64	—	59	8·7
	93 3 20	1 6·30	4	− 2 17·1	2	1 6·30	− 2 17·1		
						− 1 6·47	− 2 17·1		
	92 3 28	− 1 46·32	6	− 1 52·5	6	− 1 46·32	− 1 52·4	60	8·7
	93 3 20	1 46·22	4	1 48·8	2	1 46·21	1 48·8		
						− 1 46·26	− 1 50·6		
1452 (3254)	91 5 10	− 0 35·40	3	− 3 2·8	2	− 0 35·40	− 3 2·8	—	9·0
	91 5 11	− 0 35·28	6	3 12·1	2	0 35·28	3 12·0		
						− 0 35·34	− 3 7·4		

h. G. C.	DESCRIPTION AND REMARKS.
1134 (2787)	F, pL, dif, E np sf. Fairly clear; definition good.
II. 165 (2795)	F, L, mE ns, diffused; decidedly only of the III. Class; * 13 sf 2′. After ☾ set.
1148 (2806)	— Nucleus is oval; moonlight.
1209 (2886)	pB, pL, Ens, vl condensation; rather difficult, as the moon is not set.
1211 (2890)	pF, vvL, bMN, irr fig; 6′ np is a * 13 to which the nebulosity seems to extend. 2 vF stars involved spp and sf.
1281 (3002)	vB, vL, E sp nf, vL Nucl. E in the same direction; seems to have a large appendage on n side; I think separated from the nucleus by a dark space. Not good to observe, owing to L Nucl, though neb. is vB. Fine object; L Nucleus E in same direction as neb. Split between Nucl. and np part. B, vL, mE sp nf; L Nucl. also E, like the Andromeda nebula. The preceding star is not in any catalogue. Fine night.
1376 (3132)	vB, vL, vm E 93° ±, sbM; capital to observe. vB, L, m E pf, vmbMN; fairly clear; definition good.
1452 (3254)	Difficult with illumination; barely of II. Class; F, pL, diffused; query double, or with a F * involved south; vl or no condensation; irregular figure. [Comp. * is DM − 5°, 3584. Not in any Cat.] E np sf, but more difficult than last night. About 12^s f and 5′ north of neb. is a S cluster of 5 or 6 stars. Could this, perhaps, be the "easily resolved" object of W. Herschel? [See Notes.]

OBSERVATIONS.

h. or H. (G. C.)	Date.			App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.0.	Δδ 1890.0.	Star. No.	Star. Mag.
				m s		′ ″		m s	′ ″		
1452 (*continued.*)	91	5	11	+ 0 18·15	6	+ 4 3·0	2	+ 0 18·15	+ 4 3·0	61	8·9
1558 (3453)	92	4	29	+ 0 39·70	12	+ 10 39·5	3	+ 0 39·71	+ 10 39·4	62	9·0
	93	3	22	0 39·54	5	10 38·7	3	0 39·54	10 38·7		
								+ 0 39·63	+ 10 39·1		
1703 (3702)	92	4	29	− 0 13·16	5	− 2 13·8	3	− 0 13·16	− 2 13·8	65	8·0
		—		− 1 16·48	5	+ 0 57·6	2	− 1 16·48	+ 0 57·5	66	9·0
1705 (3704)	92	4	29	+ 2 26·47	3	+ 1 45·7	3	+ 2 26·47	+ 1 45·5	63	9·3
		—		+ 0 49·73	3	—	—	+ 0 49·73	—	64	8·8
1778 (3845)	88	5	12	+ 1 9·75	4	+ 5 48·7	4	+ 1 9·75	+ 5 48·8	67	8·7
	88	5	12	+ 0 18·65	4	− 0 48·6	4	+ 0 18·65	− 0 48·6	68	8·5
1779 (3846)	88	5	12	+ 1 26·58	4	+ 2 21·2	4	+ 1 26·58	+ 2 21·3	67	8·7
	91	5	11	1 27·13	3	2 16·6	2	1 27·13	2 16·6		
								+ 1 26·86	+ 2 18·9		
	88	5	12	+ 0 35·49	4	− 4 16·5	4	+ 0 35·49	− 4 16·4	68	8·5
1813 (3900)	88	5	11	− 0 5·18	7	+ 0 18·0	7	− 0 5·18	+ 0 18·0	69	8·2
	89	5	21	0 5·34	7	0 22·3	5	0 5·34	0 22·3		
	93	3	22	0 5·32	5	0 24·5	4	0 5·32	0 24·5		
								− 0 5·28	+ 0 21·6		
1857 (3964)	88	5	11	+ 0 42·43	5	− 2 35·4	5	+ 0 42·43	− 2 35·3	70	8·5
	88	5	12	0 41·68	4	2 32·1	4	0 41·68	2 32·0		
								+ 0 42·05	− 2 33·6		
	88	5	11	− 0 44·45	5	− 0 9·7	5	− 0 44·45	− 0 9·8	71	9·4
	88	5	12	0 45·10	3	0 7·1	3	0 45·10	0 7·2		
	91	5	3	0 44·37	4	0 6·7	5	0 44·37	0 6·7		
								− 0 44·64	− 0 7·9		
1863 (3971)	88	5	12	+ 1 26·39	4	− 4 15·0	4	+ 1 26·39	− 4 14·9	70	8·5
	88	5	12	+ 0 0·40	4	− 1 49·7	4	+ 0 0·40	− 1 49·7	71	9·4
	91	5	3	0 0·25	4	1 56·5	2	0 0·25	1 56·6		
								+ 0 0·32	− 1 53·2		

h. G. C.	DESCRIPTION AND REMARKS.
1558 (3453)	Globular cluster; two stars, 9·2 and 9·4 sf; $\Delta\alpha = 13^s{\cdot}9$ and $19^s{\cdot}8$. Magnificent globular cluster; but the centre can be well observed. A * 13 on nf edge.
1703 (3702)	B, pL, R, vmbM.
1705 (3704)	eF, vL, R; diffused; very difficult with illumination; * 10·5 3′ np; two stars 9·3 sp; second one is 2′ south of first one. Fine night; definition good.
1778 (3845)	vF, pS, vlbM. $\Delta\alpha$ and $\Delta\delta$ by oblique transits. $\Delta\alpha$ and $\Delta\delta$ by oblique transits.
1779 (3845)	$\Delta\alpha$ and $\Delta\delta$ by oblique transits, four simultaneous ones being taken over the bar in each of its two positions, of the two nebulæ and the two stars. B, pS, smbM, * 12 f.
	Oblique transits: see above.
1813 (3900)	vB, pL, R, rr. Oblique transits. Evidently a globular cluster; vB, pL, irr. fig., * 12 np. I also measured Position Angle 103°·30 (4), Dist. 83″·6 (2).
1857 (3964)	pL, irr. figure; no perceptible condensation; oblique transits. Oblique transits.
	Oblique transits. Oblique transits. pB, L, R, vgbM.
1863 (3971)	F, pS; diffused; perhaps E pf; oblique transits.
	Oblique transits. F, S, R; $\Delta\alpha$ measured from the p nebula.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.0.	Δδ 1890.0.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
3587 (4024)	89 5 21	− 1 13·16	5	+ 7 15·8	5	− 1 13·16	+ 7 15·7	72	6·5
	91 5 10	1 13·04	10	7 10·9	3	1 13·04	7 11·0		
						− 1 13·10	+ 7 13·2		
	91 5 10	− 1 35·95	4	+ 0 12·4	2	− 1 35·95	+ 0 12·3	73	9·7
2036 (4485)	89 8 31	+ 0 11·89	9	− 0 20·0	3	+ 0 11·89	− 0 19·9	74	9·3
	89 10 12	0 12·54	—	0 16·9	—	0 12·54	0 16·9		
	92 9 21	0 12·09	11	0 18·0	4	0 12·09	0 18·1		
						+ 0 12·17	− 0 18·3		
2047 (4510)	89 9 22	+ 0 54·94	5	+ 4 39·0	4	+ 0 54·93	+ 4 39·1	75	8·6
2060 I. (4532) II.	89 8 31	− 1 11·67	4	− 0 33·0	3	− 1 11·67	− 0 33·1		
	—	− 1 6·10	4	—	—	− 1 6·10	—	76	7·6
2072 (4565)	89 8 31	+ 0 40·82	5	− 10 40·2	4	+ 0 40·83	− 10 40·1		
	90 11 5	0 41·38	6	10 39·6	3	0 41·37	10 39·6	77	8·8
						+ 0 41·10	− 10 39·9		
2090 (4608)	88 9 12	− 0 19·44	10	+ 1 59·5	6	− 0 19·44	+ 1 59·4		
	89 10 12	0 18·55	—	1 52·6	—	0 18·55	1 52·6	78	9·1
	92 9 16	0 19·12	8	1 56·9	6	0 19·12	1 56·8		
						− 0 19·04	+ 1 56·3		
2102 (4632)	92 9 16	− 1 19·36	7	− 8 6·6	4	− 1 19·35	− 8 6·4		
	92 9 21	1 19·10	4	8 0·8	3	1 19·09	8 0·6	80	9·1
						− 1 19·22	− 8 3·5		
	92 9 21	+ 0 34·08	6	− 4 56·4	3	+ 0 34·08	− 4 56·5	79	8·4
2120 (4670)	88 9 8	− 1 11·20	4	+ 1 55·3	4	− 1 11·20	+ 1 55·2	81	6·0
	89 11 16	1 10·97	6	1 55·5	2	1 10·97	1 55·4		
						− 1 11·11	+ 1 55·3		
2125 (4678)	88 9 12	+ 0 36·78	8	+ 3 32·3	7	+ 0 36·78	+ 3 32·4	82	9·2
	89 9 19	0 36·44	6	3 34·0	4	0 36·44	3 34·0		
						+ 0 36·61	+ 3 33·2		

h. G. C.	DESCRIPTION AND REMARKS.
3587 (4024)	B, S, smbMN; outlying part vL; fades away gradually; good object to observe. pB, S, R, vmbM.
2036 (4485)	Globular cluster, B, pL, iF. Seems of irregular shape; triangular, with p edge nearly straight; $\Delta\alpha$ and $\Delta\delta$ deduced from observed Pos. A. = 95°·93, Dist. 163″·84 (3); sky foggy; definition good. Globular cluster, B, pL, irr. outline.
2047 (4510)	Planetary; B, pS, R; hazy outline; diameter 15″ ±, * 11·12, p 15ˢ·5, about 10″ south.
2060 (4532)	Dumb-bell Nebula. The sp part is better to observe than the nf one, the brightest part being a little sp the centre of the sp part. $\Delta\delta$ of two halves is 145″.
2072 (4565)	F, pS, nearly R; like a disc, not bM; rather faint for filar micrometer. pF, pS, R; hardly any condensation; most difficult, nebula only visible with vvF illumination; thin clouds.
2090 (4632)	pB, pL, irr R. $\Delta\alpha$ and $\Delta\delta$ deduced from observed Pos. 292°·52, Dist. 293″·5 (2). Definition good; sky clear.
2102 (4632)	pB, pL, vgbM; has a * 10m about 2′ nnp; Pos. Angle about 350°; fairly good to observe.
2120 (4670)	Globular cluster.
2125 (4678)	Not a good object to observe; diameter several minutes; outline very irregular. Fairly good object to observe, notwithstanding its size.

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.0.	Δδ 1890.0.	Star. No.	Star. Ma.
		m s		′ ″		m s	′ ″		
2135 (4718)	92 9 21	− 0 34·33	8	+ 4 8·8	4	− 0 34·33	+ 4 8·9	85	8·
	92 10 12	0 33·78	5	3 58·4	3	0 33·78	3 58·5		
	92 10 23	0 34·25	6	4 0·2	3	0 34·25	4 0·3		
						− 0 34·12	+ 4 2·6		
	92 9 21	− 0 9·93	5	—	—	− 0 9·93	—	83	9·
	92 10 12	0 9·69	5	+ 6 23·9	2	0 9·69	+ 6 24·0		
	92 10 23	0 10·22	5	6 23·7	2	0 10·22	6 23·7		
						− 0 9·95	+ 6 23·9		
	92 9 21	− 0 15·40	5	—	—	− 0 15·40	—	84	9·
	92 10 12	0 15·20	3	—	—	0 15·20	—		
						− 0 15·30			
2172 (4815)	90 11 15	+ 1 37·23	3	− 1 17·0	3	+ 1 37·22	− 1 17·1	86	9·
2174 (4823)	90 11 15	+ 0 15·15	2	+ 1 31·5	2	+ 0 15·15	+ 1 31·5	h 2172	neb
2185 (4849)	89 10 28	− 0 33·74	5	− 5 36·5	3	− 0 33·74	− 5 36·5	87	8·
	90 10 14	0 34·36	5	5 44·1	3	0 34·36	5 44·0		
	92 9 27	0 33·50	9	5 47·2	3	0 33·50	5 47·1		
	92 10 23	0 33·73	7	5 42·7	3	0 33·73	5 42·6		
						− 0 33·83	− 5 42·6		
2199 (4879)	91 10 7	− 1 39·45	4	+ 1 37·7	2	− 1 39·45	+ 1 37·8	89	8·
	91 10 9	1 40·30	2	1 37·5	2	1 40·30	1 37·6		
						− 1 39·73	+ 1 37·7		
H. 249 (4880)	91 10 9	− 0 19·05	4	− 0 34·9	2	− 0 19·05	− 0 34·9	88	8·
	91 10 25	0 18·87	10	0 37·8	3	0 18·87	0 37·8		
						− 0 18·96	− 0 36·4		
2201 (4883)	88 9 13	− 0 43·21	8	− 1 33·3	5	− 0 43·21	− 1 33·3	90	9·
	89 11 16	0 43·37	8	1 34·9	3	0 43·37	1 35·0		
						− 0 43·21	− 1 34·1		
2202 (4886)	91 10 7	+ 0 8·65	4	+ 1 35·7	2	+ 0 8·65	+ 1 35·7	89	8·
	91 10 9	0 7·80	2	1 28·1	2	0 7·80	1 28·1		
						+ 0 8·37	+ 1 31·9		

	DESCRIPTION AND REMARKS.
h. G. C.	—
2135 (4718)	F, pL, R; diffused; not difficult with illumination, but has no condensation. Very difficult; seen through rather dense fog. Very difficult with illuminated wires; sky bright. Star No. 84 is the second of three stars f the nebula, about 50″ south of first one.
2172 (4815)	Tempel's Nova np [N. G. C. 7327] well seen.
2174 (4823)	vF, vS. The other S nebulæ, nf h 2172, were too faint to be seen with bright wires.
2185 (4849)	eF when wires are even faintly illuminated; vS, iR, * 12 nearly n, or nnp; not a good night. F, S, iR, vlbM; rather difficult with bright wires. pF, S, almost stellar; good observation. Hoar frost; sky bright; definition good.
2199 (4879)	A * 10·11 follows 10^{s}·63, about 15″ south. Very difficult to hear the clock; wind very high. [$\Delta\alpha$ given half weight.]
II. 249 (4880)	pF, pS, irrR, bM, * 11 np, $\frac{3}{4}'$.
2201 (4883)	vF in moonlight; * 11 f 12^{s}·85 (4), slightly north. pB, pL, R, mbM.
2202 (4886)	— Very difficult to hear clock; wind very high. [$\Delta\alpha$ given half weight.] [See Notes.]

OBSERVATIONS.

h. or H. (G. C.)	Date.	App. Δα.	Transits.	App. Δδ.	Bisect.	Δα 1890.o.	Δδ 1890.o.	Star. No.	Star. Mag.
		m s		′ ″		m s	′ ″		
— (6112)	91 10 7	+ 0 10·26	4	+ 1 4·5	2	+ 0 10·26	+ 1 4·5	89	8·
2203 (4887)	91 10 7	+ 0 17·48	4	+ 0 35·4	2	+ 0 17·48	+ 0 35·4	89	8·
	91 10 9	0 17·15	2	0 35·7	2	0 17·15	0 35·7		
						+ 0 17·32	+ 0 35·6		
2205 (4892)	92 10 12	− 1 38·60	5	+ 0 21·6	4	− 1 38·59	+ 0 21·8	91	9·
	92 10 23	1 38·85	4	0 28·5	3	1 38·84	0 28·6		
						− 1 38·71	+ 0 25·2		
2215 (4906)	91 10 25	− 0 9·18	4	− 2 0·2	4	− 0 9·18	− 2 0·2	h 2216	neb.
	91 10 28	0 8·70	2	2 4·9	2	0 8·70	2 4·9		
						− 0 8·94	− 2 2·5		
2216 (4909)	91 10 25	− 1 36·45	4	+ 2 51·9	3	− 1 36·44	+ 2 51·8	92	8·6
	91 10 28	1 36·40	2	2 44·8	3	1 36·39	2 44·7		
						− 1 36·42	+ 2 48·3		
2226 (4928)	88 9 8	− 3 20·75	4	+ 1 28·4	4	− 3 20·75	+ 1 28·2	97	7·0
	92 9 16	—	—	1 25·5	2	—	1 25·7		
						− 3 20·75	+ 1 27·0		
	89 10 23	+ 0 7·47	3	− 7 43·0	3	+ 0 7·47	− 7 43·0	95	8·0
2227 (4932)	92 9 27	+ 1 6·95	2	—	—	+ 1 6·95	—	94	8·2
	—	+ 2 8·30	4	+ 0 23·2	3	+ 2 8·30	+ 0 23·0	93	9·0
2232 (4939)	91 10 7	− 0 26·43	4	− 1 27·1	2	− 0 26·43	− 1 27·1	96	7·0
	91 10 25	0 26·92	14	1 36·9	3	0 26·92	1 36·8		
	91 10 28	0 26·34	5	1 35·7	3	0 26·34	1 35·7		
						− 0 26·56	− 1 33·2		
2282 (5029)	88 11 6	+ 0 16·76	7	− 0 45·3	5	+ 0 16·76	− 0 45·3	98	8·8
	89 10 30	0 17·52	6	0 48·5	3	0 17·52	0 48·5		
	91 10 9	0 17·39	10	0 45·8	3	0 17·39	0 45·8		
						+ 0 17·22	− 0 46·5		

h. G. C.	DESCRIPTION AND REMARKS. —
— (6112)	eF. I should not have noticed it if I had not known its place.
2203 (4887)	[See Notes.]
2205 (4892)	Between two stars, one at each end. I observed a point a little nearer the north star. Very badly seen with illumination. The observed point is about two-thirds of the distance between the two stars at the ends, nearer the north end; several bright points involved; hoar frost; sky bright; definition good.
2215 (4906)	vF, S, R; damp night; definition good. eF.
2216 (4909)	pF, pL, mE 95°±; ill defined; no nucleus; F * f end. Would only bear vF illumination.
2226 (4928)	pB, pS, nearly R, mbM. No $\Delta\alpha$; clouds passing very often; could not perceive any nebulosity around the star 10 mag. 8′ north, as I suspected at Birr Castle in 1874.
	vF, pL, R; seen through fog.
2227 (4932)	Clouds passing continually.
2232 (4939)	pB, pL, vmbM, but not suddenly so; interrupted by clouds. — mbM, but badly seen; sky hazy.
2282 (5029)	Forms isosceles △ with 2 F stars sf. pB, pL, bM; two stars 11·12 sf. pF, pL, R, bM; two stars sf; fairly good to observe.

NOTES.

G. C. 358.—The nebulosity of this object was noticed by D'Arrest at Leipzig ("Erste Reihe," p. 311). Schönfeld did not perceive any, but merely saw a star of the eleventh magnitude in the place given by D'Arrest. In the "Monthly Notices," vol. lii., p. 441, Burnham states that he had not been able to find any nebulous object in this neighbourhood except N. G. C. 615 (= h. 137), and adds:—"There is do doubt that No. 615 is the object which has been seen in looking for the other, and that it is one of the many instances of mistaken identity." There is, however, no doubt that there is a faint star in the place indicated by D'Arrest, but it is apparently not nebulous. Engelhardt has also observed this faint star, but without seeing any nebulosity (vol. ii., p. 125).

G. C. 551 = h. 229 = II. 278.—About this object see "Monthly Notices," xxxviii., p. 104 (Winnecke), and lii., p. 102. It seems to me exceedingly doubtful whether this nebula is really subject to fluctuations of brightness as suggested by Winnecke; at any rate it has appeared pretty bright, or of the second class, to all observers except to Schönfeld (one fine night, 1861), and to Vogel (two fine nights in 1865), who were unable to see it. On November 18, 1887, I found it "pB, of the second class, m E ns, psbM, N = * 13 m." I agree most cordially in what Mr. Burnham says about the doubtful value of negative evidence (*l. c.*, p. 449).

G. C. 1519–20 = h. 444–45 = II. 316–17.—See my Paper "On some Nebulæ suspected of Variability or Proper Motion," M. N., xlvii., p. 416. This pair of nebulæ have certainly not changed their relative positions since 1862, and the rough estimates of H. and h. are not sufficient to prove anything as to the time before that year.

G. C. 2030 = h. 678 = II. 639.—The two very faint nebulæ observed here are identical with two which I observed at Birr Castle in 1876, and which had been first seen with Lord Rosse's six-foot telescope in 1854. I have not seen any of M. Bigourdan's new nebulæ. (See N. G. C. and "Comptes Rendus," 14th Nov., 1887.)

G. C. 2405 = h. 882 = I. 20.—About the alleged variability of this object, see "Astron. Nachr.," No. 2293 (Winnecke), and "Monthly Notices," lii., p. 102. The evidence is, as usual, very slender indeed. Great weight cannot be attached to the circumstance that Boguslawski (using a 3½ inch refractor) inserted it as bright on the Berlin map, hora XI., as he probably only did so because W. Herschel had classed it as a bright nebula of Class I. The neighbouring bright star rather interferes with the proper estimation of the brightness of the nebula.

In the "Birr Observations," 1848–78, p. 96, second column should for h. 950 be read 882; also G. C. 2404 is = h. 881 = I. 219, and not = 948 (III. 284).

G. C. 2501 = h. 945 = I. 94.—In the notes to the G. C., Sir J. Herschel points out that "H. makes this by one observation E north and south, by another E nf sp, while h. has two observations agreeing in making it extended in the parallel;" and he adds, "surely it does not rotate?" D'Arrest calls it "longiuscula," but says nothing about the direction. Schultz makes it E nearly in parallel. My observation (E 83°) agrees with all the previous observations, except the first one by H., in which *ns.* is doubtless a mere slip of the pen for *pf.* There has, therefore, not been any change in this object.

G. C. 2652 = h. 1041 = II. 733.—The estimated position angle of elongation agrees with h. No change (as h. seems half to suspect in a note in the G. C.)

G. C. 3254 = h. 1452 = I. 41.—Not measured micrometrically before. The R. A. of h. (which is adopted in the N. G. C.) is correct. Though H. once called it bright (another time *pB*), there does not appear to be any reason to think it variable. It is a diffused object, without condensation, and the appearance of this class of objects is, according to my experience, more influenced by the state of the atmosphere than that of more condensed objects generally is. Compare "Monthly Notices," lii., pp. 102, 103.

G. C. 4886–87 = h. 2202–2203 = III. 210–211.—I observed these objects in 1885 with the small micrometer, in order to test the alleged change of relative positions. (See M. N., xlvii., p. 421.) The preceding one is rather faint for bright wires, and the elongation of the p one makes $\Delta\delta$ rather difficult to measure. My $\Delta\delta$ of h. 2202 of Oct. 9, 1891 (88″·1) should, perhaps, be rejected, though the two single measures agree well *inter se;* but it differs too much from Vogel (104″·1) and Schönfeld (102″·7), while my result of Oct. 7, 1891 (95″·7), combined with my two measures of h. 2203, gives $\Delta\delta$ of the two nebulæ = 60″·1, in perfect accordance with Schultz's directly measured $\Delta\delta$ (61″·0, three nights).

COMPARISON STARS.

FOR nearly all the stars with which the nebulæ were micrometrically connected, I have been able to find good and recent meridian observations, and I am specially indebted to the observers of the zones of the *Astronomische Gesellschaft*, who have kindly communicated their unpublished results for most of the stars north of the equator. Some of my stars were unfortunately below the limit of magnitude (9·0) of the zones, but these were nearly all found in *Bonner Beobachtungen*, vol. vi., or in Romberg's Pulkova Catalogue. I have, therefore, only in a few cases found it necessary to recur to Lalande's or Bessel's observations, but, whenever these had to be used, they were reduced anew by von Asten's and Luther's tables. In the case of stars which have been very frequently observed, I have only used recent determinations. In order to make the earlier star places homogeneous with those of the zones, they were all reduced to Auwers' fundamental system. The catalogues for which Argelander had deduced corrections to the system of Wolfers' *Tabulæ Reductionum*,* were referred to Auwers by means of Dr. Oertel's table in "Astronomische Nachrichten," vol. 121, p. 230 (table for 1860). The positions from the "Second Armagh Catalogue," and the "Munich Catalogue," were corrected by the tables given in these works, the Glasgow places by the table in the "Vierteljahrsschrift," xix., p. 198, the "Argentine General Catalogue" by the table in the "Annalen der Sternwarte bei München," i., p. xxviii., the "Greenwich Ten Year Catalogue" by Mr. Downing's table in the "Monthly Notices," li., p. 309, combined

* In "Bonner Beobachtungen," vol. vii., and in a printed, but not published, posthumous paper by Argelander—"Untersuchungen über neue Sterne mit Eigenbewegungen," 125 pp., 4°. It is very strange that this Paper has not been published, though it forms a most valuable continuation of Argelander's memoir on the P. M. of 250 stars, bringing the number of proper motions determined by him up to 482.

with the comparison Cape—Auwers (V. J. S., xx., p. 170), and the "Nine Year Catalogue" by the table in Auwers' Fundamental Catalogue, pp. 10–11. The catalogue in vol. viii. of the "Observations de Pulkova," which depends on $\frac{1}{2}$ (Pulkova 1845 + 1865), was corrected by the table in Romberg's Catalogue, p. (14), two first columns, combined with the table for "Pulkova 1845," pp. 10–11 of Auwers' Catalogue. Romberg was assumed identical with Auwers, as the differences are extremely minute. For the positions taken from the Paris Catalogues, I deduced corrections by direct comparison with Auwers. Finally, when all this had been done, and the catalogue of comparison stars had been drawn up, Professor Auwers published in the "Astron. Nachr.," No. 3195 (Nov. 1893) a set of tables for reducing various catalogues to his system. I then went over those catalogues a second time, for which I had used indirect comparisons, and found that in most cases these had been quite sufficient.

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
1	Arg. Oe.,	0 24 49·18	+ 60 49 49·9	1	1
	Helsingfors Zones,	49·27	51·7	2	2
		0 24 49·24	+ 60 49 51·1		
2	Rümker II. 227,	0 29 3·07	− 8 54 13·3	2	1
	Schjellerup, 192,	3·09	16·3	1	1
		0 29 3·08	− 8 54 14·8		
3	Leipzig (A.N. 1639),	0 31 51·61	+ 47 41 17·9	2	1
	Bonn Zone,	51·92	15·8	2	1
		0 31 51·77	+ 47 41 16·8		
4	B. B. VI.,	0 34 31·78	− 14 29 19·4	5	2
	Santini, IV.,	31·89	21·9	2	1
	Carlton College,	31·96	19·4	2	2
		0 34 31·87	− 14 29 19·9		
5	Arg. Oe.,	0 45 51·68	+ 46 59 49·5	1	1
	Bonn. Zone,	51·27	46·6	2	2
		0 45 51·41	+ 46 59 47·6		
6	B. B. VI.,	1 23 34·99	− 7 25 1·3	2	1
	Königsb. (AN. 1768),	34·96	3·8	2	1
	Paris,	34·95	3·3	1	1
	Carlton College,	35·33	2·1	2	1
		1 23 35·06	− 7 25 2·6		
7	Lalande, 2770,	1 25 39·91	− 7 35 53·9	1	0
	Bessel (W. 404),	39·92	61·7	1	0
	Ottakring Zones,	39·70	58·2	1	1
	Karlsruhe (1892),	39·67	58·8	2	2
		1 25 39·68	− 7 35 58·6		
8	[a] Romberg,	1 28 10·63	− 7 35 15·5	4	2
	[b] Argent. G. C.,	10·68	15·3	4	2
	[c] Radcliffe Obs. 1883–84,	10·54	15·2	3	1
	[d] Carlton College,	10·73	15·0	2	1

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
16	[f] Pulkova, VIII.,	2 26 33·59	− 1 31 14·4	4	1
	Glasgow, 565,	33·51	16·4	5, 3	1
	Argent. G. C.,	33·53	14·9	4	1
	Becker (Berlin),	33·56	15·3	4, 5	2
	Radcliffe Obs., 1886,	33·50	14·8	3	1
	10 Year Cat.,	33·57	15·0	4, 6	2
	Karlsruhe, II.,	33·43	15·6	3, 4	1
	Carlton College,	33·50	15·0	2	1
		2 26 33·53	− 1 31 15·2		
17	Paris,	2 29 14·28	+ 28 44 26·8	2, 1	1
	Cambridge Zones,	14·38	25·7	4	2
		2 29 14·34	+ 28 44 26·1		
18	Klinkerfues,	2 35 51·68	+ 0 4 28·7	1	1
	Göttingen,	51·66	31·1	3	2
	Glasgow, 614,	51·68	30·1	5, 3	2
	Karlsruhe, IV.,	51·66	30·1	1	1
		2 35 51·67	+ 0 4 30·2		
19	B. B. VI.,	2 37 39·29	− 0 22 52·4	2	2
	Königsberg (A.N. 1392),	39·41	53·7	5	2
	Schj., 758,	39·26	51·6	1	1
	Göttingen,	39·28	52·5	2	2
		2 37 39·34	− 0 22 52·7		
20	B. B., VI.,	2 39 18·71	− 0 28 8·6	3	1
	Göttingen,	18·78	8·5	2	1
		2 39 18·75	− 0 28 8·5		
21	[g] Bessel (W. 718),	2 43 35·33	− 8 8 23·6	1	0
	B. B., VI.,	35·52	29·2	2	1
		2 43 35·52	− 8 8 29·2		
22	B. B., VI.,	2 53 45·25	+ 24 48 25·9	2	1
	Romberg,	45·16	25·8	4	2
	Berlin Zone,	[illegible]	[illegible]	[illegible]	[illegible]

	Romberg,	5·22	29·8	4	1
	Leiden Zones,	5·18	29·0	2	1
	Cambridge Zones,	5·25	28·9	8	2
		1 29 5·20	+ 30 6 29·6		
10	Bessel,	1 29 13·89	+ 30 12 42·8	1	1
	B. B. VI.,	13·73	43·7	2	2
		1 29 13·78	+ 30 12 43·4		
11	Königsberg (A.N. 1392),	1 29 15·53	− 7 56 20·0	2	1
	B. B. VI.,	15·35	20·1	3	1
	Carlton College,	15·67	20·0	3	1
		1 29 15·52	− 7 56 20·0		
12	B. B. VI.,	1 52 37·69	− 6 34 22·3	2	1
	Dunsink, VI.,	37·67	22·0	3, 2	1
		1 52 37·68	− 6 34 22·1		
13	B. B. VI.,	1 52 43·08	− 6 30 20·8	1	1
	Carlton College,	43·50	15·3	1	1
		1 52 43·29	− 6 30 18·0		
14	B. B. VI.,	2 24 52·13	+ 36 40 31·9	2	2
	Lund Zones,	52·43	29·9	1	1
		2 24 52·23	+ 36 40 31·2		
15	B. B., VI.,	2 26 32·50	− 1 40 52·0	2	1
	Göttingen,	32·65	50·8	2	1
	Armagh, II. 328,	32·56	51·2	3	1
	Paris,	32·49	51·4	8	2
	Carlton College,	32·48	52·1	2	1
		2 26 32·53	− 1 40 51·5		

	Paris,	51·88	13·5	2	2
	Carlton College,	51·98	12·1	2	2
		3 16 51·86	− 15 51 13·0		
24	B. B., VI.,	4 7 9·02	− 13 3 12·9	2	1
	[h] Berlin,	9·04	12·8	—	1
		4 7 9·03	− 13 3 12·9		
25	Paris,	4 26 55·77	− 5 16 24·2	2	1
	Karlsruhe, IV.,	55·73	22·7	2	1
	Carlton College,	55·85	23·2	2	1
		4 26 55·78	− 5 16 23·4		
26	B. B., VI.,	5 32 30·15	− 6 47 18·8	2	—
27	B. B., VI.,	5 33 31·32	+ 9 2 11·9	2	1
	Romberg,	31·26	10·8	2	1
		5 33 31·29	+ 9 2 11·3		
28	B. B., VI.,	5 35 30·40	+ 9 6 27·3	4	2
	Romberg,	30·37	27·7	3	2
	Leipzig Zones,	30·57	26·9	2	1
		5 35 30·42	+ 9 6 27·4		
29	B. B., VI.,	7 21 16·70	+ 29 38 48·8	2	1
	Paris,	16·51	48·4	2	1
	Romberg,	16·76	48·7	2	1
	Cambridge Zones,	16·62	48·4	3	1
		7 21 16·65	+ 29 38 48·6		
30	B. B., VI.,	7 22 40·66	+ 21 9 49·7	2	1
	Engelmann (A.N. 2485),	40·69	51·1	2	1
	Paris,	40·55	49·4	2, 1	1
	Romberg,	40·56	49·1	4	2
	Berlin Zones,	40·55	50·0	3	2
		7 22 40·59	+ 21 9 49·8		

[a] Epoch, 1877·2. [b] Epoch, 1878·9. [c] Epoch, 1884·3. [d] Epoch, 1888·7. [e] P. M. assumed = + 0ˢ·0124 − 0″·091 (Stumpe).
[f] 75 Ceti (P. M. − ˢ·002 − 0″·032 acc. to Auwers, neglected. [g] Query P.M. [h] Potsdam Obs., VIII., p. 181.

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
31	Schj., 2797, . . .	7 36 19·90	− 14 33 45·5	1	1
	Pulkova, VIII., . .	20·01	46·9	2	1
	Engelmann (A.N. 2485),	19·95	46·6	5	2
		7 36 19·95	− 14 33 46·4		
32	Arg. Oe., 5892, . .	7 37 13·17	− 17 57 2·1	2	1
	B. B., VI., . . .	13·15	2·1	1	1
		7 37 13·16	− 17 57 2·1		
33	Arg. Oe., 6977, . .	8 28 28·58	− 15 44 5·6	2	1
	B. B., VI., . . .	28·73	4·7	2	1
	Paris, ...	28·62	6·4	2, 3	1
		8 28 28·64	− 15 44 5·6		
34	Karlsruhe, II., . .	8 49 50·07	− 2 43 38·9	5	—
35	B. B., VI., . . .	9 5 17·48	+ 7 28 41·0	2	1
	Romberg, . . .	17·48	40·6	5	2
		9 5 17·48	+ 7 28 40·7		
36	[a] Pulkova, VIII., . .	9 14 28·53	− 11 30 40·1	4	1
	New Seven-Year Cat., .	28·51	41·4	3, 4	1
	Arg. Gen. Cat., . .	28·46	40·0	4	1
	Stone, 4971, . . .	28·46	40·2	2	1
	Radcliffe, 1885, . .	28·48	40·1	3	1
	Romberg, . . .	28·52	39·8	4	1
		9 14 28·49	− 11 30 40·3		
	[a] 26 Hydræ.				
37	Königsberg (A.N., 1392)	9 24 6·65	+ 22 3 49·2	2	1
	B. B., VI., . . .	6·50	50·6	2	1
	Paris, ...	6·47	49·0	5, 4	2
	Romberg, . . .	6·44	49·4	4	2
	Berlin Zones, . .	6·45	48·8	3	2

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
48	Paris, ...	11 34 25·51	+ 37 5 8·4	3	1
	Romberg, . . .	25·60	7·7	4	2
	Lund Zones, . . .	25·57	7·6	2	1
		11 34 25·57	+ 37 5 7·8		
49	Paris, ...	11 40 50·65	+ 14 18 3·1	1	1
	Leipzig Zones, . .	50·61	2·9	3	2
		11 40 50·62	+ 14 18 3·0		
50	Munich, 7378, . .	11 50 4·77	+ 7 28 30·8	1	1
	Munich, II., 4173, . .	4·53	31·6	1	1
	Leipzig Zones, . .	4·74	31·6	3	2
		11 50 4·70	+ 7 28 31·4		
51	B. B., VI., . . .	11 54 59·02	+ 44 31 52·0	1	—
52	B. B., VI., . . .	12 5 51·29	+ 16 38 3·6	2	—
53	B. B., VI., . . .	12 7 19·33	+ 1 56 4·7	3	—
54	B. B., VI., . . .	12 7 29·79	+ 13 40 22·9	2	1
	Leipzig Zones, . .	29·67	22·6	3	1
		12 7 29·73	+ 13 40 22·7		
55	B. B., VI., . . .	12 9 36·95	+ 13 45 18·6	3	1
	Romberg, . . .	37·08	15·7	4	1
		12 9 37·02	+ 13 45 17·1		
56	Brussels, 5048, . .	12 15 14·36	+ 16 9 5·6	3, 2	1
	B. B., VI., . . .	14·56	6·2	2	1
	Berlin Zones, . .	14·38	5·6	3	1
		12 15 14·43	+ 16 9 5·8		
57	B. B., VI., . . .	12 15 45·14	+ 16 26 17·1	3	—

38	Munich, 2517,	9 35 40·23	+ 0 53 32·5			
	Berlin (A.N. 1925),	40·27	53·2	2	1
	Albany Zones,	40·29	53·5	2	1
		9 35 40·26	+ 0 53 53·0		
39	B. B., VI.,	9 52 12·59	+ 32 54 36·1	2	—
40	B. B., VI.,	10 6 17·01	+ 39 18 34·0	2	1
	Lund Zones,	17·05	34·9	2	1
		10 6 17·03	+ 39 18 34·5		
41	B. B., VI.,	10 7 6·99	+ 3 39 26·1	2	1
	Paris,	7·14	23·2	2	1
	Albany Zones,	7·03	26·4	3	1
		10 7 7·05	+ 3 39 25·2		
42	B. B., VI.,	10 40 25·73	+ 29 12 38·4	2	—
43	B. B., VI.,	10 45 10·51	+ 29 4 34·9	2	1
	Cambridge Zones,	10·48	33·3	3	1
		10 45 10·49	+ 29 4 34·1		
44	Berlin Zones,	10 48 35·02	+ 23 32 24·7	3	—
45	B. B. VI.,	11 10 13·20	+ 13 26 47·6	2	1
	New Seven-Year Cat.,	13·20	47·4	5	2
	Glasgow, 2906,	13·08	46·3	5	2
	Nine-Year Cat.,	13·12	46·7	5	2
	Paris,	13·09	47·9	6, 6	2
	Romberg,	12·99	47·3	4	2
		11 10 13·10	+ 13 26 47·3		
46	Leipzig Zones,	11 12 42·14	+ 5 6 47·8	2	—
47	Glasgow, 2939,	11 19 16·72	+ 12 2 4·6	4, 5	2
	Ten-Year Cat.,	16·69	4·2	4, 8	2
	Leipzig Zones,	16·84	4·1	2	1
		11 19 16·73	+ 12 2 4·3		

	Munich, 8349,	23·27	48·8	2	1
	Carlton College,	23·34	49·2	2	1
		12 35 23·32	− 10 58 49·5		
60	B. B., VI.,	12 36 2·87	− 10 59 17·9	2	2
	Munich, 8361,	3·00	16·3	3	2
	Munich, II., 4555,	2·70	18·1	1	1
	Carlton College,	3·06	17·1	2	2
		12 36 2·94	− 10 59 17·2		
61	Munich, 8551,	12 44 59·59	− 5 51 39·1	1	—
62	Berlin Zones,	13 6 52·10	+ 18 34 36·1	3	—
63	B. B., VI.,	13 48 13·51	+ 5 31 26·8	2	—
64	Munich, 9636,	13 49 49·82	+ 5 29 30·6	3	1
	Leipzig Zones,	50·05	33·7	2	2
		13 49 49·97	+ 5 29 32·7		
65	Munich, 9653,	13 50 48·73	+ 5 49 47·9	7	2
	Munich, II., 5104,	48·81	49·2	1	1
	Romberg,	48·85	48·3	4	3
	Glasgow, II., 1174,	48·77	50·2	2	2
	Leipzig Zones,	48·89	48·3	2	2
		13 50 48·81	+ 5 49 48·7		
66	Munich, 9669,	13 51 52·10	+ 5 46 39·5	3	1
	Schj., 4986,	52·10	39·5	1	1
	B. B., VI.,	52·12	38·5	3	2
	Romberg,	52·07	39·8	5	2
	Leipzig Zones,	52·19	39·7	2	1
		13 51 52·10	+ 5 46 39·3		
67	B. B., VI.,	14 13 21·17	+ 4 24 3·0	2	1
	Brussels, 5784,	21·02	4·3	2	1
	Pulkova, VIII.,	21·22	5·7	2	1
	Romberg,	20·97	3·4	4	2
	Albany Zones,	21·06	3·2	2	1
		14 13 21·07	+ 4 24 3·8		

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
68	Romberg,	14 14 12·09	+ 4 30 45·7	4	—
69	B. B., VI.,	14 23 55·58	− 5 29 31·6	2	2
	Schj., 5142,	55·73	31·0	1	1
	Dunsink, IV.,	50·70	31·1	4	2
	Engelmann,	55·49	30·5	3	2
	Arg. G. C.,	55·53	30·3	1	1
	Romberg,	55·47	31·8	2	2
		14 23 55·57	− 5 29 31·1		
70	Bessel (W. 586),	14 33 51·70	+ 0 13 33·3	1	0
	Munich, 10398,	50·87	37·9	1	1
	Bond Zones,	50·95	37·2	2	1
		14 33 50·91	+ 0 13 37·5		
71	B. B., VI.,	14 35 17·41	+ 0 11 9·6	2	1
	Romberg,	17·47	10·9	4	2
		14 35 17·45	+ 0 11 10·5		
72	Brussels, 6014,	14 56 17·17	− 7 8 25·3	4, 2	1
	Arg. G. C.,	17·30	25·9	3	1
	Radcliffe, 1885,	17·22	26·0	3	1
		14 56 17·23	− 7 8 25·7		
73	B. B., VI.,	14 56 40·48	− 7 1 29·9	4	—
74	B. B., VI.,	19 12 5·80	+ 29 59 34·0	3	1
	Engelmann,	5·73	33·8	5	1
	Cambridge Zones,	6·08	31·9	3	1
		19 12 5·87	+ 29 59 33·2		
75	Munich, 21449,	19 36 50·51	− 14 29 30·3	2	1
	Schj., 7545,	50·42	29·4	1	1
	Königsb. (A.N. 1392),	50·47	30·0	3	2
	Carlton College,	50·33	26·6	1	1

No.	Authority.	R. A., 1890.	Dec., 1890.	No. of Obs.	Weight.
		h m s	° ′ ″		
83	Romberg,	21 49 9·56	+ 2 18 55·1	4	2
	Albany Zones,	9·62	53·9	2	1
		21 49 9·58	+ 2 18 54·7		
84	De Ball,	21 49 14·80	+ 2 18 5·1	—	1
	Albany Zones,	14·84	4·2	2	1
		21 49 14·82	+ 2 18 4·6		
85	Schj., 8914,	21 49 33·60	+ 2 21 14·3	1	1
	Albany Zones,	33·88	14·4	2	2
		21 49 33·79	+ 2 21 14·4		
86	Bonn, VI.,	22 30 25·02	+ 33 52 3·9	2	1
	Leiden Zones,	25·01	4·2	3	1
	Romberg,	24·95	3·4	4	1
		22 30 24·99	+ 33 52 3·8		
87	Bessel (W. 913),	22 45 29·39	− 2 1 54·0	1	1
	Santini, V.,	29·73	48·4	2	1
		22 45 29·56	− 2 1 51·2		
88	B. B., VI.,	22 55 58·34	+ 15 48 24·7	2	1
	Romberg,	58·34	24·5	4	1
	Berlin Zones,	58·35	25·2	2	1
		22 55 58·34	+ 15 48 24·8		
89	B. B., VI.,	22 56 16·31	+ 15 21 47·8	3	2
	Schj., 9456,	16·26	48·9	1	1
	Glasgow, 6043,	16·33	48·4	4, 3	2
	Romberg,	16·31	48·9	4	2
	Berlin Zones,	16·31	49·4	2	2
		22 56 16·31	+ 15 21 48·7		
90	B. B., VI.,	22 56 27·67	+ 29 34 47·8	2	1
	Romberg,	27·62	46·9	4	2
	Cambridge Zones,	27·84	47·0	8	3
		22 56 27·74	+ 29 34 47·1		
91	B. B., VI.,	23 1 3·95	+ 11 43 3·4	2	1
	Romberg,	[illegible]	[illegible]	[illegible]	[illegible]

	B. B. VI.,			28·18			8·2	2	2		Romberg,	23	10	44·52	+	3	53	17·9	4	2
	[c] Rümker, 7900,			58·63			8·3	4	2		Albany Zones,			44·54				18·8	3	2
	[d] B. B. VI.,			58·79			3·8	3	2			23	10	44·54	+	3	53	18·5		
	[e] Berlin Zones,			58·76		24	59·4	2	2											
	[f] Pechüle,			58·79			56·5	2	2											
		19	55	58·80	+ 22	24	57·3 [g]			93	B. B., VI.,	23	11	3·50	− 8	11	18·5	2	—
77	Leiden Zones,	20	11	16·03	+ 30	24	18·3	2	—	94	Bessel (W. 192),	23	12	5·69	− 8	8	37·9	1	1
78	B. B., VI.,	20	47	43·59	− 12	59	0·7	3	1		Kremsmünster (A.N. 2250)			5·58			36·5	1	1
	Königsb. (A.N. 1392),			44·21			1·6	3	1			23	12	5·64	− 8	8	37·2		
	Leipzig (A.N. 1639),			43·84			0·4	3	1	95	Bessel (W. 198),	23	12	13·18	− 5	7	26·5	1	0
		20	47	43·88	− 12	59	0·9				Santini, II. (438),			13·17			18·2	1	1
											Klinkerfues,			13·14			19·7	1	1
79	B. B., VI.,	20	58	20·01	+ 29	32	42·5	2	1			23	12	13·16	− 5	7	19·0		
	Romberg,			20·13			42·0	4	2	96	B. B., VI.,	23	15	26·85	+ 16	38	56·9	2	1
	Cambridge Zones,			20·09			41·6	3	1		Glasgow, 6152,			27·06			57·5	3, 4	1
		20	58	20·09	+ 29	32	42·0				Berlin Zones,			26·81			57·2	2	1
											Romberg,			26·93			57·1	4	2
80	B. B., VI.,	21	0	13·47	+ 29	35	50·8	2	1			23	15	26·92	+ 16	38	57·2		
	Cambridge Zones,			13·28			49·5	3	1	97	B. B., VI.,	23	15	41·35	− 5	16	28·9	2	2
		21	0	13·37	+ 29	35	50·1				Glasgow, 6155,			41·31			27·6	4, 5	2
											Armagh, II.,			41·38			30·7	3	2
81	B. B., VI.,	21	25	50·44	+ 11	39	16·1	4	1		Berlin (A. N.),			41·46			28·6	2	2
	Glasgow, 5491,			50·45			15·4	6, 4	1		Pulkova, VIII.,			41·40			28·3	2	2
	Armagh, II., 2852,			50·47			15·3	4	1		Arg. G. C.,			41·36			28·2	1	1
	Harvard,			50·45			15·8	6	1		Radcliffe, 1882,			41·37			26·6	1	1
	Ten-Year Cat.,			50·37			15·4	3	1		Karlsruhe, II.–IV.,			41·32			31·2	6	2
	Romberg,			50·37			15·3	4	1		Carlton College,			41·37			28·7	3	2
	Leipzig Zones,			50·39			14·5	4, 3	1			23	15	41·37	− 5	16	28·9		
		21	25	50·42	+ 11	39	15·4												
										98	B. B., VI.,	23	49	23·79	+ 5	18	55·4	2	1
82	B. B., VI.,	21	27	9·90	− 1	22	7·6	3	1		Leipzig Zones,			23·89			56·1	4	2
	Romberg,			9·82			8·8	4	1		Albany Zones,			23·90			57·2	2	1
		21	27	9·86	− 1	22	8·2					23	49	23·87	+ 5	18	56·2		

[a] Epoch, 1796·6. [b] Epoch, 1825·7. [c] Epoch, 1840. [d] Epoch, 1862·6. [e] 1881·7. [f] 1893·7.

[g] The Proper Motion (which has not been noticed before) is = + 0ˢ·0032, − 0″·252, and represents the observations thus :—

	h	m	s	°	′	″		h	m	s	°	′	″
Lalande,	19	55	58·65	+ 22	24	62·0	Bonn,	19	55	58·88	+ 22	24	56·9
Bessel,			58·92			56·9	Berlin,			58·79			57·3
Rümker,			58·79			55·7	Pechüle,			58·78			57·4

Lalande has two wire transits agreeing well. Dr. Pechüle's observations were kindly made at my request with the Transit Circle at Copenhagen.

RESULTING POSITIONS OF 100 NEBULÆ FOR 1890.o.

G. C.	h. & H.	R. A., 1890.			Prec.	Decl. 1890.			Prec.	Obs.	Comp. Star.
		h	*m*	*s*	*s*	°	′	″	″		
68	VI. 35	0	25	20·60	+ 3·3376	+ 60	54	15·6	+ 19·931	2	1
78	II. 3	0	29	10·29	3·0456	− 9	0	23·3	19·891	2	2
90	35	0	32	53·04	3·2828	+ 47	43	57·2	19·847	4	3
107	46	0	35	2·77	3·0200	− 14	28	38·2	19·819	3	4
158	71	0	45	52·07	3·3567	+ 46	56	57·8	19·653	2	5
342	128	1	25	49·66	+ 3·0084	− 7	26	8·5	+ 18·660	4	6, 7
343	130	1	26	5·05	3·0083	− 7	27	52·2	18·656	1	7
348	—	1	26	32·80	3·3580	+ 30	4	39·0	18·641	1	h. 131
349	—	1	27	0·62	3·3594	+ 30	4	31·8	18·626	1	h. 131
351	132	1	27	20·91	3·0062	− 7	35	53·1	18·615	2	8
352	131	1	27	39·27	+ 3·3617	+ 30	5	24·8	+ 18·604	1	9
355	133	1	28	20·61	3·3653	+ 30	13	11·6	18·582	2	10
358	—	1	28	45·82	3·0018	− 7	58	29·0	18·568	1	11
363	137	1	29	35·34	3·0019	− 7	54	12·2	18·541	1	11
470	183	1	54	12·03	2·9997	− 6	29	52·7	17·615	4	12, 13
549	226	2	24	4·51	+ 3·6574	+ 36	38	44·7	+ 16·220	2	14
551	229	2	24	56·90	3·0504	− 1	35	56·5	16·174	2, 1	15, 16
560	232	2	27	45·11	3·5147	+ 28	49	36·0	16·028	2	17
591	258	2	36	6·17	3·0723	− 0	1	48·6	15·579	2	18
600	262	2	37	3·13	3·0651	− 0	28	59·0	15·527	2	19, 20
604	264	2	40	34·85	+ 2·9507	− 8	2	36·3	+ 15·329	2, 1	21
627	II. 619	2	53	15·85	3·4962	+ 24	47	52·5	14·590	1	22
692	2523	3	16	59·29	2·7860	− 15	47	40·2	13·091	1	23
826	2618	4	9	7·20	2·7986	− 13	1	5·3	9·325	2	24
866	319	4	26	13·74	2·9576	− 5	19	23·8	7·978	2	25
1202	IV. 33	5	31	4·87	+ 2·9144	− 6	47	12·2	+ 2·523	2	26
1225	365	5	36	4·78	3·2834	+ 9	1	50·0	+ 2·087	3	27, 28
1519	444	7	18	37·60	3·7908	+ 29	42	7·4	− 6·745	2	29
1520	445	7	18	39·70	3·7908	+ 29	42	24·1	6·748	2	h. 444
1532	450	7	22	40·23	3·5556	+ 21	8	8·8	7·077	2	30
1565	464	7	36	47·02	+ 2·7576	− 14	28	36·6	− 8·219	2	31
1567	3095	7	37	0·78	2·6774	− 17	57	3·7	8·236	2	32
1672	513	8	28	18·84	2·7713	− 15	46	19·1	12·090	2	33
1721	536	8	48	54·58	3·0280	− 2	38	56·9	13·477	2	34
1725	—	8	49	26·82	+ 3·0282	− 2	34	13·9	− 13·511	2	34

RESULTING POSITIONS OF 100 NEBULÆ FOR 1890.0—*continued.*

G. C.	h. & H.	R. A., 1890.			Prec.	Decl. 1890.			Prec.	Obs.	Comp. Star.
		h	*m*	*s*	*s*	°	′	″	″		
1726	538	8	50	3·46	+ 3·0252	− 2	45	5·9	− 13·551	3	34
1727	—	8	50	15·70	3·0259	− 2	42	31·6	13·564	1	34
1730	II. 281	8	50	34·61	3·0223	− 2	55	23·9	13·585	1	h. 538
1771	564	9	4	29·24	3·1939	+ 7	29	3·1	14·453	2	35
1835	592	9	16	8·69	2·8951	− 11	26	30·6	15·142	2	36
1861	604	9	25	56·14	+ 3·4086	+ 21	59	3·5	− 15·690	2	37
1898	626	9	36	24·31	3·0840	+ 0	50	10·5	16·244	1	38
1973	657	9	51	54·03	3·5310	+ 32	53	35·5	17·002	2	39
2028	680	10	6	59·18	3·1131	+ 3	40	19·8	17·664	3	41
2030	678	10	7	17·30	3·5893	+ 39	18	31·0	17·676	2	40
2204	755	10	42	7·94	+ 3·3213	+ 29	10	57·9	− 18·907	2	42
2220	768	10	44	42·41	3·3121	+ 29	3	7·4	18·981	2	43
2243	786	10	46	38·29	3·2556	+ 23	31	10·0	19·035	2	44
2347	840	11	8	51·79	3·1415	+ 13	24	59·2	19·556	2	45
2361	849	11	11	49·51	3·0977	+ 5	9	19·6	19·612	2	46
2405	882	11	18	42·64	+ 3·1232	+ 11	56	45·3	− 19·729	3	47
2501	945	11	35	29·25	3·1806	+ 37	9	20·9	19·939	1	48
2541	973	11	40	8·35	3·1022	+ 14	22	40·2	19·978	3	49
2626	1022	11	50	18·80	3·0798	+ 7	21	40·6	20·035	3	50
2652	1041	11	52	51·21	3·1135	+ 44	33	33·8	20·043	1	51
2757	1112	12	5	1·13	+ 3·0638	+ 16	38	42·7	− 20·048	2	52
2768	1119	12	6	40·89	3·0630	+ 13	48	58·5	20·045	2	54
2776	1126	12	7	14·21	3·0711	+ 1	54	39·7	20·043	3	53
2787	1134	12	8	16·64	3·0607	+ 13	46	56·5	20·040	2	54
2795	II. 165	12	9	40·60	3·0588	+ 13	38	19·3	20·035	1	55
2806	1148	12	10	18·14	+ 3·0575	+ 13	45	40·5	− 20·033	2	55
2886	1209	12	16	56·45	3·0440	+ 16	8	54·1	19·999	1	56
2890	1211	12	17	21·05	3·0428	+ 16	25	57·1	19·996	1	57
3002	1281	12	22	49·18	2·9410	+ 44	41	58·4	19·954	2	58
3132	1376	12	34	16·76	3·1109	− 11	1	7·4	19·826	4, 3	59, 60
3254	1452	12	45	17·74	+ 3·0992	− 5	47	36·1	− 19·663	1	61
3453	1558	13	7	31·73	2·9407	+ 18	45	15·2	19·288	2	62
3702	1703	13	50	35·59	3·0092	+ 5	47	35·8	17·764	2	65, 66
3704	1705	13	50	39·84	3·0096	+ 5	33	12·3	17·761	2, 1	63, 64
3845	1778	14	14	30·78	3·0143	+ 4	29	54·8	16·698	2	67, 68
3846	1779	14	14	47·81	+ 3·0151	+ 4	26	24·8	− 16·684	3	67, 68
3900	1813	14	23	50·29	3·1464	− 5	29	9·5	16·233	3	69
3964	1857	14	34	32·87	3·0698	+ 0	11	3·1	15·664	5	70, 71
3971	1863	14	35	17·61	3·0703	+ 0	9	19·1	15·624	3	70, 71
4024	3587	14	55	4·26	+ 3·1864	− 7	1	14·2	− 14·481	3	72, 73

RESULTING POSITIONS OF 100 NEBULÆ FOR 1890.0—*continued.*

G. C.	h. & H.	R. A., 1890.			Prec.	Decl. 1890.			Prec.	Obs.	Comp. Star.
		h	*m*	*s*	*s*	°	′	″	″		
4485	2036	19	12	18·04	+ 2·3391	+ 29	59	14·9	+ 6·222	3	74
4510	2047	19	37	45·37	3·3854	− 14	24	50·2	8·296	1	75
4532	2060, I.	19	54	47·13	2·5890	+ 22	24	24·2	9·629	1	76
4565	2072	20	11	57·13	2·4193	+ 30	13	38·4	10·918	2	77
4608	2090	20	47	24·84	3·3015	− 12	57	4·6	13·380	3	78
4632	2102	20	58	54·16	+ 2·5360	+ 29	27	46·2	+ 14·011	3	79, 80
4670	2120	21	24	39·31	2·8988	+ 11	41	10·7	15·619	2	81
4678	2125	21	27	46·47	3·0915	− 1	18	35·0	15·790	2	82
4718	2135	21	48	59·62	3·0420	+ 2	25	17·6	16·865	8, 5	83, 84, 85
4815	2172	22	32	2·21	2·7366	+ 33	50	46·7	18·592	1	86
4823	2174	22	32	17·36	+ 2·7374	+ 33	52	18·2	+ 18·603	1	h. 2172
4849	2185	22	44	55·73	3·0885	− 2	7	33·8	18·987	4	87
4879	2199	22	54	36·58	2·9690	+ 15	23	26·4	19·241	2	89
4880	II. 249	22	55	39·38	2·9677	+ 15	47	48·4	19·268	2	88
4883	2201	22	55	44·53	2·8627	+ 29	33	13·0	19·271	2	90
4886	2202	22	56	24·68	+ 2·9717	+ 15	23	20·6	+ 19·286	2	89
6112	—	22	56	26·57	2·9718	+ 15	22	53·2	19·287	1	89
4887	2203	22	56	33·63	2·9720	+ 15	22	24·3	19·290	1	89
4892	2205	22	59	25·29	3·0000	+ 11	43	28·3	19·357	2	91
4906	2215	23	8	59·18	3·0524	+ 3	54	4·3	19·559	2	h. 2216
4909	2216	23	9	8·12	+ 3·0523	+ 3	56	6·8	+ 19·561	2	92
4928	2226	23	12	20·57	3·0979	− 5	15	1·9	19·621	2, 3	95, 97
4932	2227	23	13	12·08	3·1115	− 8	10	55·5	19·637	2, 1	93, 94
4939	2232	23	15	0·36	2·9947	+ 16	37	24·0	19·668	3	96
5029	2282	23	49	41·09	+ 3·0669	+ 5	18	9·7	+ 20·033	3	98